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TECHNOLOGY DEPARTMENT

First Copy

Construction Methods

October 1929

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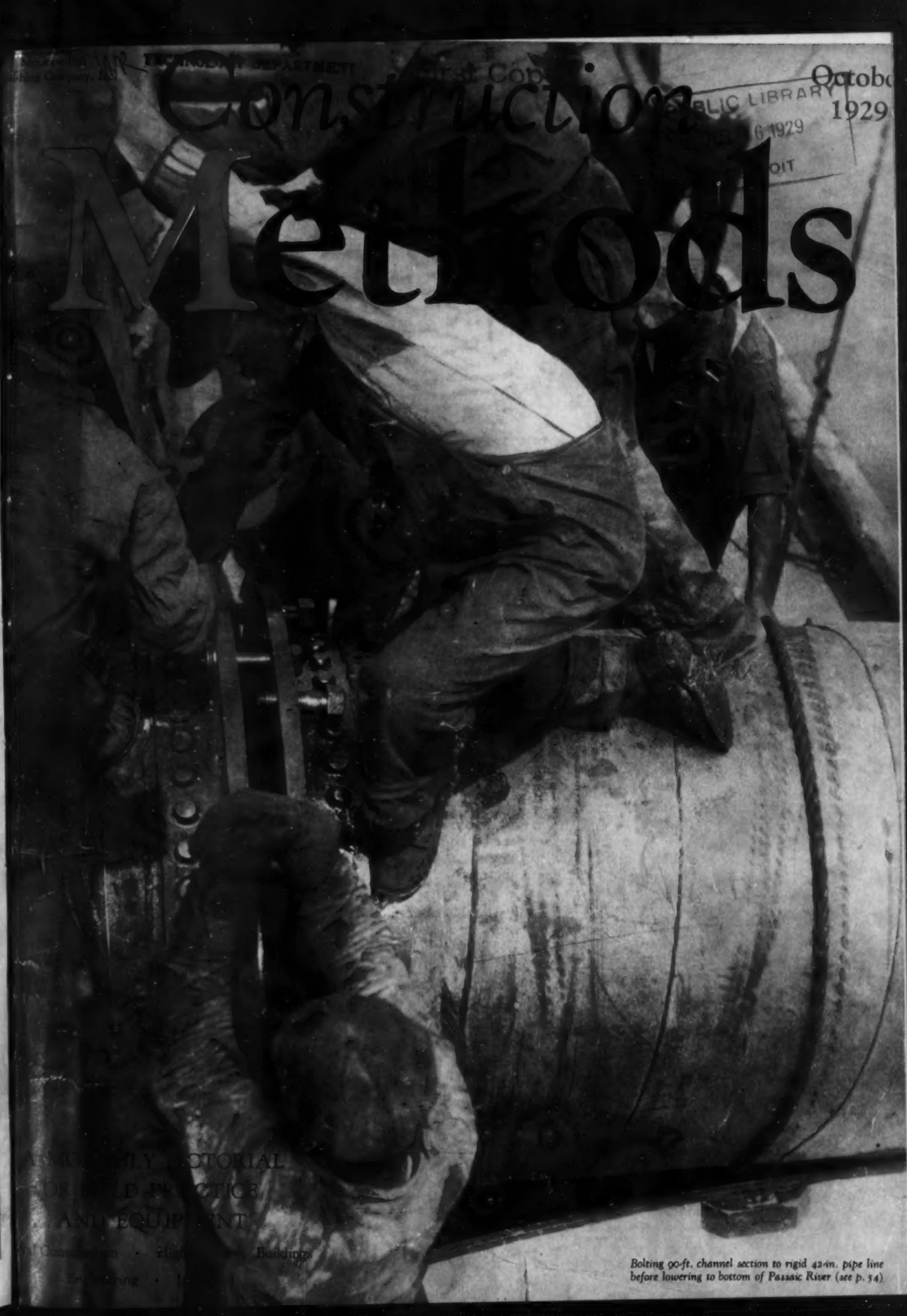
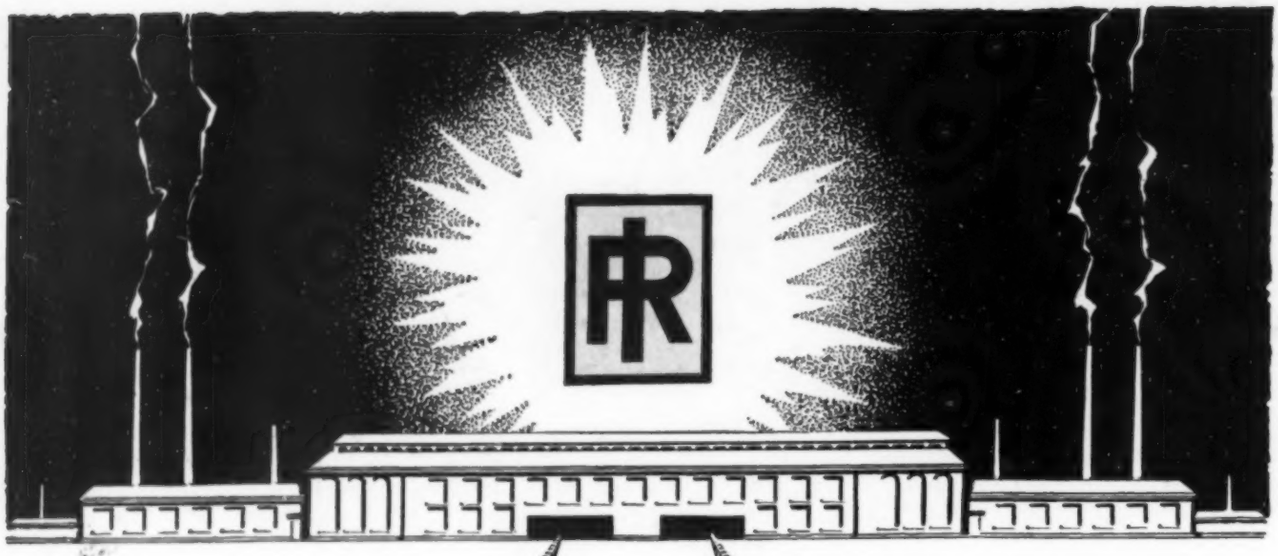


Bolting 90-ft. channel section to rigid 42-in. pipe line before lowering to bottom of Passaic River (see p. 54)



The I-R shops at Painted Post, N. Y., are devoted exclusively to the manufacture of air compressors

Here the portable units are manufactured, assembled, and made ready for shipment to all parts of the world.

A RECORD YEAR *for* PORTABLE COMPRESSORS

I-R Portables are designed and manufactured in the world's largest air compressor plant. They are sold in quantities great enough to insure uniformly high quality, interchangeability of parts, and a moderate price range throughout the entire line.

In many respects, 1929 is proving a banner year for these compressors, and the labor-saving possibilities of the outfits are being realized as never before.

Write for a copy of "100 and 1 Ways to Save Money with Portable Compressors." It will show you, by actual cost comparisons, why Ingersoll-Rand machines are replacing hand labor in the leading branches of industry.

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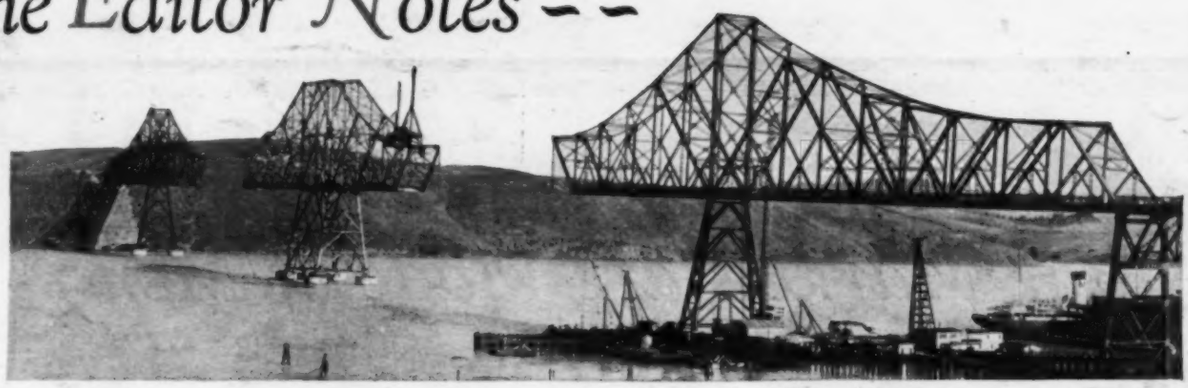
CONSTRUCTION METHODS, October, 1929. Vol. 11, No. 10. Published monthly. McGraw-Hill Publishing Company, Inc., Tenth Avenue at Thirty-sixth Street, New York, N. Y. Two years for $1; per copy, 5 cents. Entered as second-class matter, October, 1926 issue. Vol. 8, No. 10, at the Post Office at New York, N. Y., under the Act of March 5, 1879. Printed in U. S. A.

The Editor Notes - -



To Confer on Airports

A NEW field for the road builder has been opened up by the extensive program of airport construction now under way in the United States. The preparation of runways and landing areas involves an adaptation of the same methods, equipment and materials as have been developed for modern highway construction. An indication of the community of interest among the highway engineer, the contractor and the airport builder is afforded by the announcement of a joint conference in Washington Oct. 24-25 between the American Road Builders' Association and the Aeronautical Chamber of Commerce of America. The growth of aviation has been so rapid and spectacular that its leaders may well turn their attention to one of its basic problems—landing fields for air traffic.

Justifying Skyscraper Construction

While skyscrapers 2,000 ft. high are structurally possible their economic height, based on maximum net income obtainable from the investment, is much less, according to results of a study recently presented to the American Institute of Steel Construction by W. C. Clark, vice-president of S. W. Straus & Co. Under an assumption of land value at $200 per square foot and a 200x400-ft. plot in the Grand Central Terminal district of New York, designs in accordance with the city's zoning laws were prepared for seven buildings, ranging in height from 8 to 75 stories. For each structure accurate estimates of cost and income were made. Net income on investment, the figures show, increases from 4.22 per cent for an 8-story building to a maximum of 10.25 per cent for a 63-story building. For land valued at $400 per square foot the curve of economical building height reaches its peak at the 75-story level. The figures contradict the contention sometimes made that the extremely tall building is an "economic fallacy"—that even from the private owner's point of view it doesn't pay.

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, *Editor*

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD

J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, *Publishing Director*

A McGraw-Hill Publication
Tenth Avenue at 36th Street, New York

A Point Well Made

The editor of *Construction Methods* has received the following communication:

"Sir:

"Your safety campaign is a valuable addition to your paper. Construction is necessarily a hazardous business and the field presents a good opportunity for missionary work.

"On p. 60 of your September issue there is a photograph of an operation in which a

heavy steel column base is being placed on its foundation. Do you not believe that this photograph shows flagrant violation of safe practice? It appears to me that two men are under the steel billet and one riding it, while it is supported, presumably, by a derrick. If I am wrong, I would appreciate an explanation."

A. W. CRISFIELD.
Du Pont Club,
Waynesboro, Va.

A reproduction, herewith, of the illustration referred to indicates that Mr. Crisfield's point is well taken. We shall be glad to hear from other readers and to receive photos illustrating both safe and unsafe practices.

No More Separate Contracts

AS THE result of tie-ups on federal buildings in Washington and Cleveland, due to labor difficulties, U. S. Treasury Department officials have decided to abandon the policy of attempting to deal directly with separate contractors for various parts of the work. In the future, it is stated, all of the work will be let to the lowest-bidding general contractor, thus freeing the government from the responsibility of co-ordinating the operations or from the necessity of adjusting disputes between union and non-union contractors.

The recent trouble was brought about by the refusal of the union labor employed by the contractor for the structural work on an addition to the Printing Office to remain on the same job with non-union workers employed by the contractor for the mechanical work. As the government recognizes neither union nor non-union labor in such cases and must accept the lowest bid, it was powerless to avert the disagreement and the resulting tie-up.

Road Show in January

The Road Show, held in Cleveland for the last two years and, before that, in Chicago, will appear in a new setting next January. Atlantic City, N. J., will be the Mecca for American road builders and the exhibit of equipment and materials will be staged in that city's enormous new Convention Hall. Officials of the American Road Builders' Association are making plans for handling the largest attendance and the biggest exhibit of equipment in the organization's history. Remember the date—Jan. 13 to 18—and make your reservations now.

More Safety Pictures

Again this month *Construction Methods* presents (on pp. 42-43) a group of pictures illustrating the application of safety principles on the construction job. Contractors are beginning to realize that safety pays.

For Markets are Made of Men

DAY by day this "Big Parade" flows on its endless way.

In its ranks march thousands of young engineers, newly graduated from the colleges to begin their careers. Ahead of them, thousands more are moving up into positions of greater responsibility.

Thousands of workmen, too, are stepping into foremen's jobs; foremen are becoming superintendents; superintendents are advancing into business for themselves.

Other thousands are shifting from one branch of engineering or construction into another, where they must meet strange conditions, tackle new problems and master new arts.

And day by day, all these men, face to face with new responsibilities, are looking for help. They must learn more and more about the methods, materials and equipment that will help them to make good in new jobs.

To the editor of *Construction Methods* they compose a new group of readers come to draw upon the store of data and experience he brings to them. To the manufacturer they constitute a new market, open minded to what he can tell them of materials, tools, or equipment that might help to speed them on their way.

This parade is endless and knows no halt. So the alert manufacturer keeps his story constantly within its view. Thus only can he be sure that these new eyes will catch his name early in the march; that these fresh minds will early receive an impression of his house and its service that will abide throughout their onward march.

For, after all, markets are made of men, and whatever is made of men must be subject to endless change.

Willard Chevalier
Publishing Director.

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BYERS ½yd BULLDOG *dug* 875 *lineal ft.*

* *Competitive* 1 yd *shovel dug* 900 *lineal ft.*

Same Job . . . . . Same Time

WE'RE hearing better job reports on Byers ½ yd. Bulldog every day! Some yardage figures are almost unbelievable — *but they're true.* Everybody has a good word about the Bulldog.

On this particular job the Bulldog worked side by side against a well known 1 yd. gas ___*___. A road surface was cut 18 in. and on the sides averaged 4 ft. deep. The Bulldog moved up 875 feet while the 1 yd. ___*___ moved up 900 ft. in one day. Material and type of digging was the same.

For speed and flexibility the Bulldog can't be beat. It has Byers Special Independent reversible cable crowd. The Direct Drive to drums puts all the power on the dipper; the big motor adds the powerful push to go through tough materials; and the finest steel casting construction throughout makes Byers Bulldog strong and long lived.

If you want a small shovel that will give you big yardage reports every day write for the Bulldog Catalog. It's waiting for you.

It's *the* Byers CROWD that does it

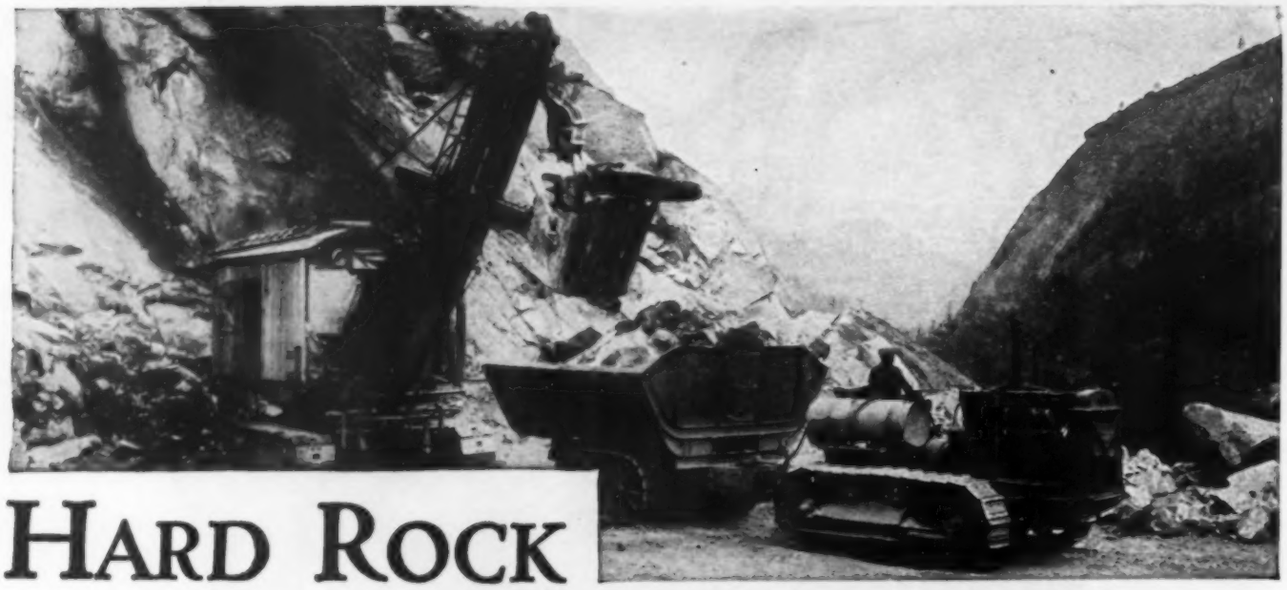
* *Name on request*

THE BYERS MACHINE COMPANY, Ravenna, Ohio

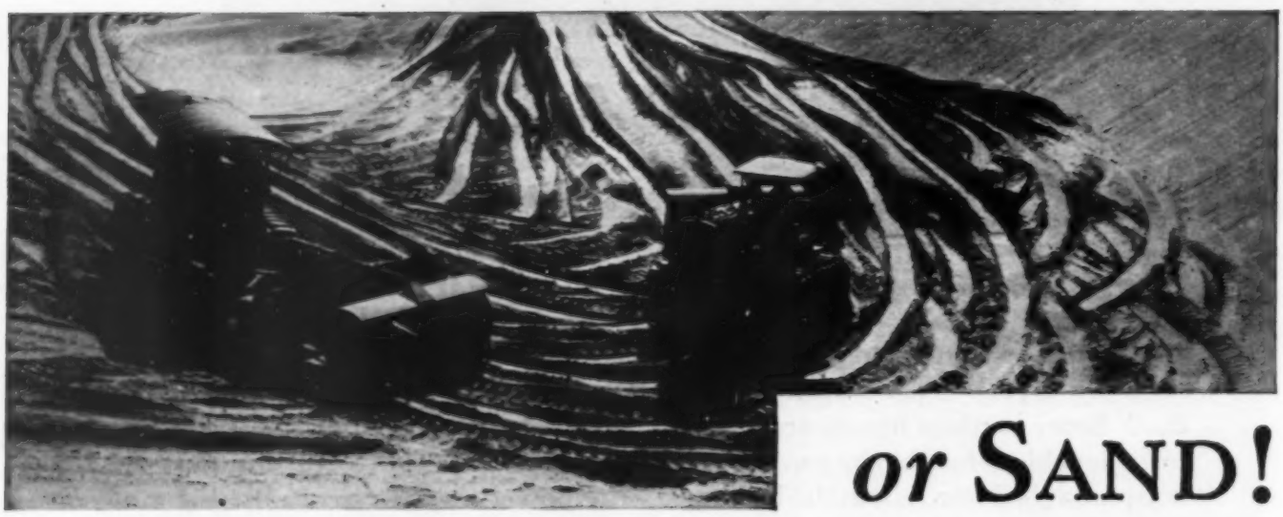
Byers 1¼ yd. full circle Master Shovel, Crane, Dragline, Trencher
Byers ¾ yd. full circle Shovel, Crane, Dragline, Trencher, Skimmer
Byers ½ yd. full circle Bulldog Shovel, Crane, Dragline, Trencher, Skimmer
Byers ½ yd. half circle Bear Cat Shovel, Crane, Trencher, Skimmer

SALES AND SERVICE THROUGHOUT THE COUNTRY

BYERS BULLDOG



HARD ROCK



or SAND!

Tracks that grip in blow sand—power for heavy loads of solid rock—stamina for uninterrupted service—that's the "Caterpillar" track-type tractor! Skilful heat-treatment of parts exposed to wear, ingenious protection of the vitals from dust, a generous track area—these are "Caterpillar" features that win records in the world's toughest outdoor jobs!

Prices—f. o. b. Peoria, Illinois

TEN	$1125	TWENTY	$1975
FIFTEEN	$1500	THIRTY	$2475
	SIXTY $4300		

Caterpillar Tractor Co.

EXECUTIVE OFFICES: SAN LEANDRO, CALIFORNIA

Sales Offices: Peoria, Illinois 50 Church St., New York San Leandro, Calif.

Holt Combined Harvesters - Russell Road Machinery

"Caterpillar" Tractors

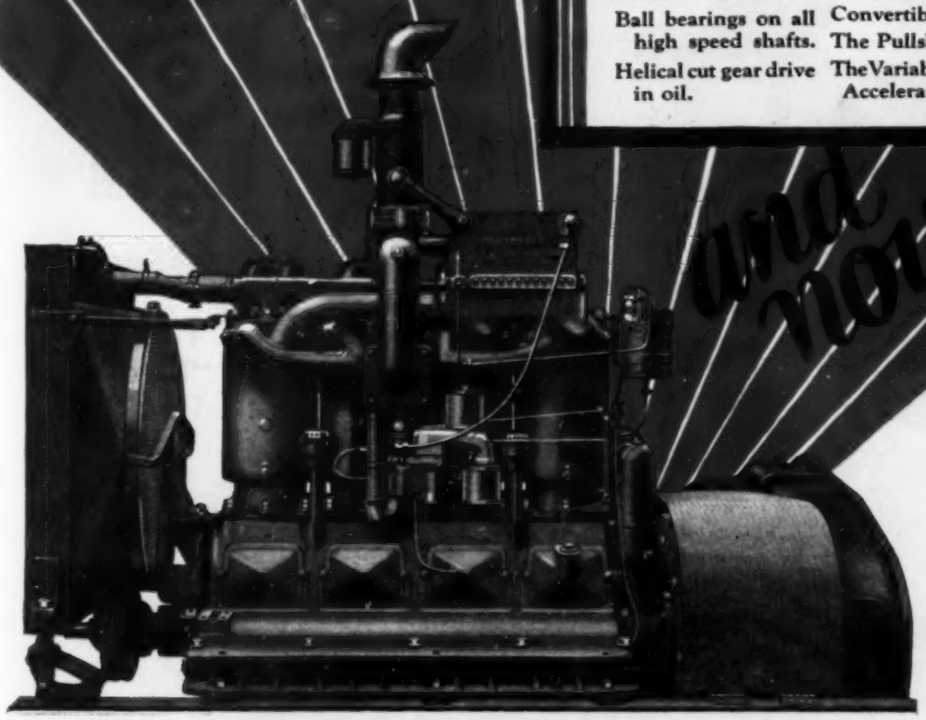
CATERPILLAR

REG. U.S. PAT. OFF.

TRACTOR

NORTHWEST PIONEERED

- Gasoline power on a shovel and crane.
- Positive traction.
- Ball bearings on all high speed shafts.
- Helical cut gear drive in oil.
- Shipment complete on one flat car.
- The patented cable crowd.
- Convertibility.
- The Pullshovel.
- The Variable Speed Motor Accelerator Controlled.



and NOW—an oil engine *without Diesel complications*

The Northwest Oil Engine built on gas principles!

The Northwest Oil Engine brings the dependability of gasoline power. It has spark plugs, magneto—features of equipment and principles of operation that your operator understands, and it is free from delicate and intricate metering devices.

Fuel can be purchased practically anywhere! Losses of fuel by theft are eliminated!—and you burn low grade fuel without any use of water, other than for cooling, securing smooth, reliable operation free from the troubles of the Diesel.

Ask about this amazing Northwest engine.

NORTHWEST ENGINEERING CO.

The world's largest exclusive builders of gasoline and electric powered shovels, cranes and draglines

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NORTHWEST

CM10-Gray

The New "Erector" HYSTER

HYSTER

mounted on a "Caterpillar" Sixty
OPERATES SIX DRUMS

In Louisville, Kentucky, the American Bridge Company is building a new municipal bridge. The work must be done quickly . . . an immense amount of steel erection. Two drums on the Hyster and four extra drums operating from its intermediate shaft do the lifting and pulling in record time.

* * * * * * *

It will pay you to investigate HYSTER now. See your "Caterpillar" dealer or write us for full information.

2931

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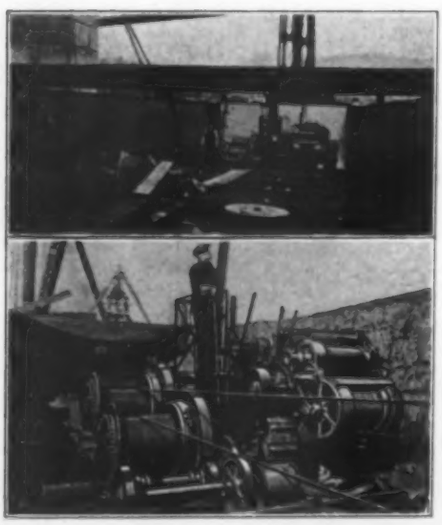
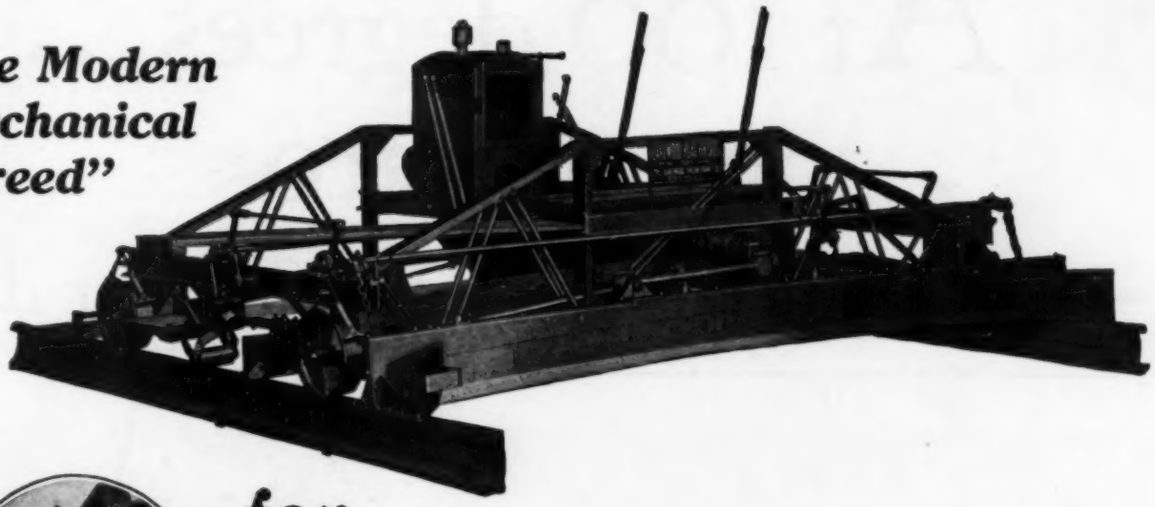
PORTLAND, OREGON . . . PEORIA, ILLINOIS



HYSTER mounted on a "Caterpillar" operated on construction of new Municipal bridge, Louisville, Kentucky.

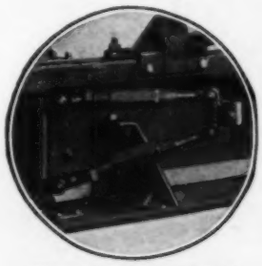
LAKEWOOD PAVING EQUIPMENT

"The Modern Mechanical Screed"



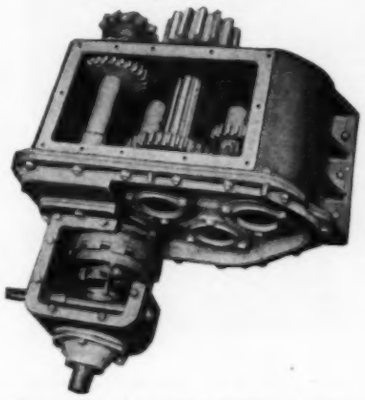
for

Concrete or Asphalt



Turnbuckles on screed member for tilting adjustment

The ONLY *Mechanical Screed with–*



Cover removed on transmission showing automotive construction

Automotive type of construction. There are 22 Timken roller bearings in this machine—High grade alloy steel shafts and gears. All gears enclosed and running in oil.

Two speeds forward and two reverse with an automotive type of transmission.

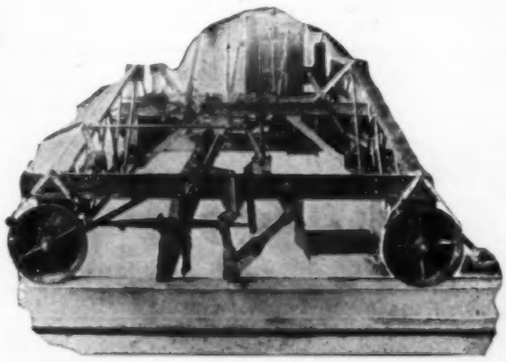
A screed member which *can be tilted* to give the same surfacing action obtained with a hand trowel. Prevents scoring in coarse aggregate and dry concrete.

Direct shaft drive to ALL wheels. Every ounce of weight is used to the maximum advantage in "pushability".

Equal distribution of weight on the forms, minimizing form displacement.

Combined screed and tamper operation can be provided for if desired.

There are many other exclusive advantages in this improved Screed, all of them are explained in detail in our Bulletin 47-C. There are still some copies left.



Weight of machine equally distributed on the forms

EXPORT OFFICES: 30 Church St., New York City · · CABLE ADDRESS: Breslow

LAKEWOOD

The Lakewood Engineering Co., CLEVELAND · O.

At 100 degrees... or at zero

—*it's as smooth as the top of your desk!*

The famous road from Denver to Colorado Springs which daily carries an almost incredible amount of tourist and commercial traffic. Its concrete surface is unmarred by travel and temperature, because it is protected by Carey Elastite Expansion Joint, properly installed at thirty-foot intervals.

When it's summer-time in Colorado, concrete surfaces are *hot*—100 degrees or more, and, in winter, sub-zero temperatures are the rule. Yet the concrete road which winds and dips from Colorado Springs to Denver is utterly unmarked by the strains of expansion and contraction. Never a hump, never a hollow . . .

It is protected by the famous Carey Elastite Expansion Joint!

The time-tested, pioneer protection for concrete construction work! It will not melt, it will not become brittle, neither can it disintegrate—the impact of traffic bonds the joint more tightly. Indispensable, yet it adds but a trifle to the aggregate cost of construction. Be sure to have us send you full particulars on Expansion Joint installation.

Carey Elastite EXPANSION JOINT

THE PHILIP CAREY COMPANY, *Lockland,* CINCINNATI, OHIO

5 minutes with a Gas + Air user—

Dragline, Clamshell and Drag Shovel, as well as Shovel

Every Gas + Air Shovel is quickly convertible for other kinds of work—with the same advantages of greater Speed and Power.

may mean *years* of better business— *thousands of dollars* extra profits for you

Ask some of the users of Gas+Air BUCYRUS-ERIE'S about the Bigger Production they are getting. You'll hear reports like these:

"The Gas+Air will out-speed, out-dig, out-travel and out-last any of them." — *Brown Constr. Co., Inc., Sacramento, Calif.* "Gas+Air BUCYRUS-ERIE'S output is far superior."— *Ocala Lime Rock Co., Ocala, Fla.* "Our Gas+Air BUCYRUS-ERIES dig rings around our large shovels every day."— *Morrison-Knudsen Co., Boise, Idaho.* "Moved more material than our two 1¼ yard shovels."—*Lewis Constr. Co., Los Angeles, Calif.*

Why the Gas+Air is faster:

It has direct-connected engines, air-operated, for crowding and swinging. These engines respond instantly to the touch of throttle levers.

No clutch to set for swinging— starts instantly, swings faster and smoother, stops without a jar. *No clutch to set for crowding*— instant response, and perfect control for accurate cutting.

Unequalled digging power

In hard digging the operator can hoist with the *full power* of the gasoline motor. The independent air operated crowding engine does not reduce the power available for hoisting.

Built with extra strength, to back up its greater speed and power.

Read some of the reports from owners, in the 64-page book: "Making More Money with the Gas+Air." Sent free— write us for it.

BUCYRUS-ERIE COMPANY

General Offices: South Milwaukee, Wis.

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Adv. 792

Ransome 56&84-S MIXERS

Giant Mixers for Continuous Service

Pioneering leadership, always typical of Ransome is shown in these "big" mixers, designed as a permanent tool for continuous operation on large construction jobs, central mixing plants and for use in industrial plants and the mining field.

To develop mixers of this size and capacity called for long experience. Ransome had this experience. It called for foresight. Ransome had such vision. It drew upon a rare degree of engineering genius. Ransome possessed the necessary skill.

"Big" mixers, as built by Ransome, fill a vital need. They are real tools —permanent tools—and considered as such by their users.

Get this New Ransome Bulletin

Then you will have the complete story—illustrated with interesting pictures and full descriptions of parts and the many typical Ransome features.

A glance through this Bulletin will prove the great contribution made by Ransome to mixing problems. May we send you a copy?

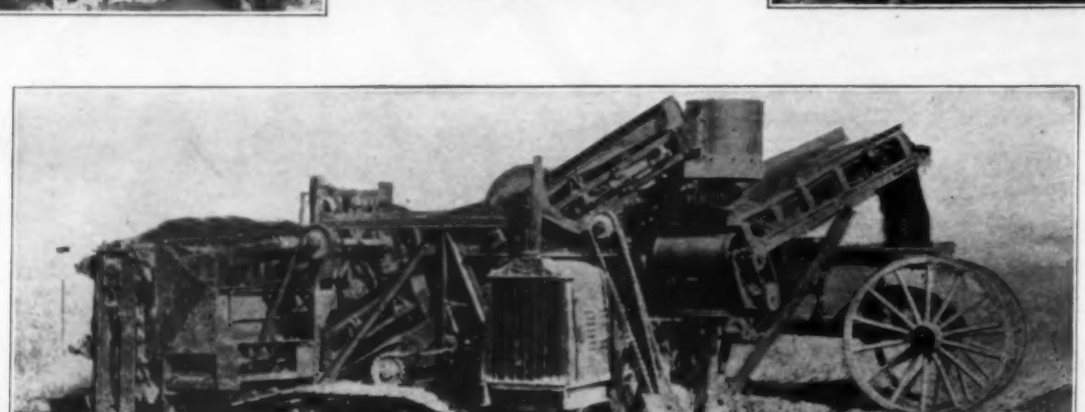
Ransome Concrete Machinery Company

1850—Service for 79 Years—1929

Dunellen **New Jersey**

A Mouthful at Every Bite—
and always digging for more!
The Type "M" Owen sinks its teeth and lips deep into practically any kind of material, closes quickly and brings up a capacity load. It's a 100 percent efficient excavator and the narrow model can't be beat for trench work. Contractors like these Sturdy Owen "M's" for general purpose equipment because they do a "bigger day's work." That's guaranteed. Send for the Type "M" Folder or for a complete catalog.
THE OWEN BUCKET COMPANY
6873 Breakwater Avenue
Cleveland, Ohio
OWEN
BIGGER DAY'S WORK
Owen Buckets

"Thru the mill"—for 9 months



The New B-G Excavator

Contractors who saw and inspected the new B-G Excavator at the 1929 Road Show, or chanced upon jobs, during the last nine months, where B-G Excavators were at work, have flooded the Barber-Greene Offices with inquiries regarding this amazing new machine.

But, in accordance with Barber-Greene's sound engineering policy, no performance data was released—no orders were accepted—until a more definite promise could be made as to what the machine is capable of doing.

Now, several machines have been used for many months on such jobs as road grading, cutting shoulders, stripping gravel beds, excavating cellars, depressed roads, golf courses, tennis courts and all kinds of cut and fill work.

By actual use B-G Excavators have proved their ability to trim 1 inch from the surface or go down 9 feet—to cut within ½ inch of finished grade—to dig excavations with straight sides—to grind the material up fine instead of discharging it in large chunks—to give far greater excavating speed than 1½ yard shovels on many jobs.

Performance records and pictures on all of the above and many more jobs are included in the new performance booklet entitled, "Specifications and Performance Data on the New Barber-Greene Excavator." Send for your copy today. No obligation.

BARBER B G GREENE

Barber-Greene Company
530 W. Park Avenue, Aurora, Illinois

BARBER-GREENE COMPANY
530 West Park Ave., Aurora, Illinois
Please send me the new booklet on the new Barber-Greene B-G Excavator.

Name .....

Address .....

City ..... *State* .....

"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE

An Economical Shovel Rope—and WHY

In the first place, "HERCULES" (Red-Strand) Wire Rope is economical because of the yardage it can handle for each dollar of its cost.

But that is not all. It costs money to put on a new rope and production work stops while it is being done. The long life of "HERCULES" makes changes less frequent, which means a big saving in both time and money.

—And the qualities that make "HERCULES" (Red-Strand) Wire Rope an economical shovel rope also make it economical for all kinds of work that requires strength and stamina.

Made Only by **A. Leschen & Sons Rope Co.** Established 1857

5909 Kennerly Avenue
ST. LOUIS

New York Chicago Denver San Francisco

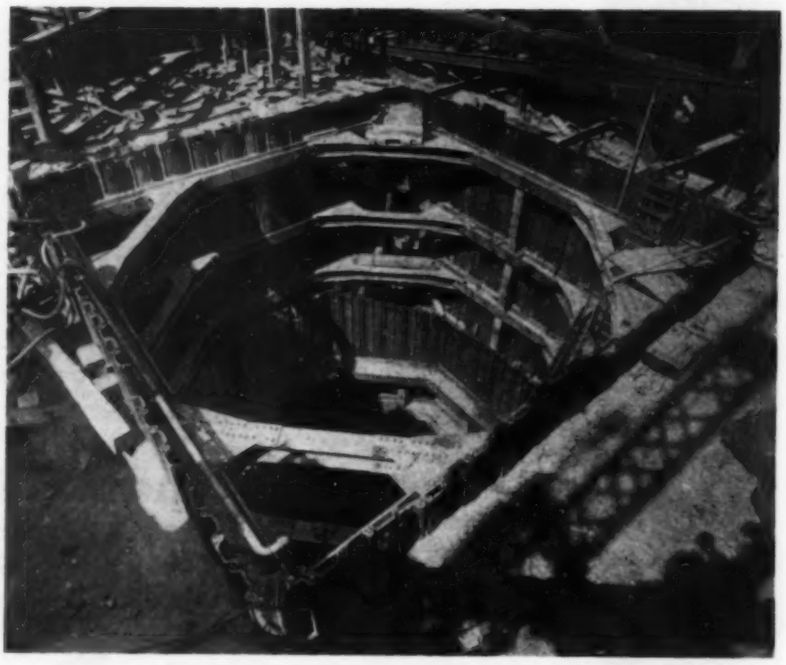
Highway Building in Cuba,
By Warren Brothers Co.

LACKAWANNA STEEL SHEET PILING
in shaft construction
for City Water Tunnel No. 2
—*New York City*

Shafts No. 2 and 2A for this water tunnel were sunk to bed rock—approximately 80 feet below the surface—in cofferdams of Lackawanna 15″ x 9/16″ Arch-Web Steel Sheet Piling.

The large rectangular cofferdam (125 ft. x 100 ft.) shown below, is the enclosure for both of the shafts. Each shaft was constructed in a "telescopic" cofferdam (see right) the upper part of which was square, and the lower part octagonal.

The cofferdams were braced throughout with steel bracing, to afford the maximum unobstructed space for excavation.



Above: "Telescopic" cofferdam for Shaft No. 2A

Left: Cofferdam enclosure for Shafts Nos. 2 and 2A

PATRICK McGOVERN, INC.
New York City
Contractors

BETHLEHEM

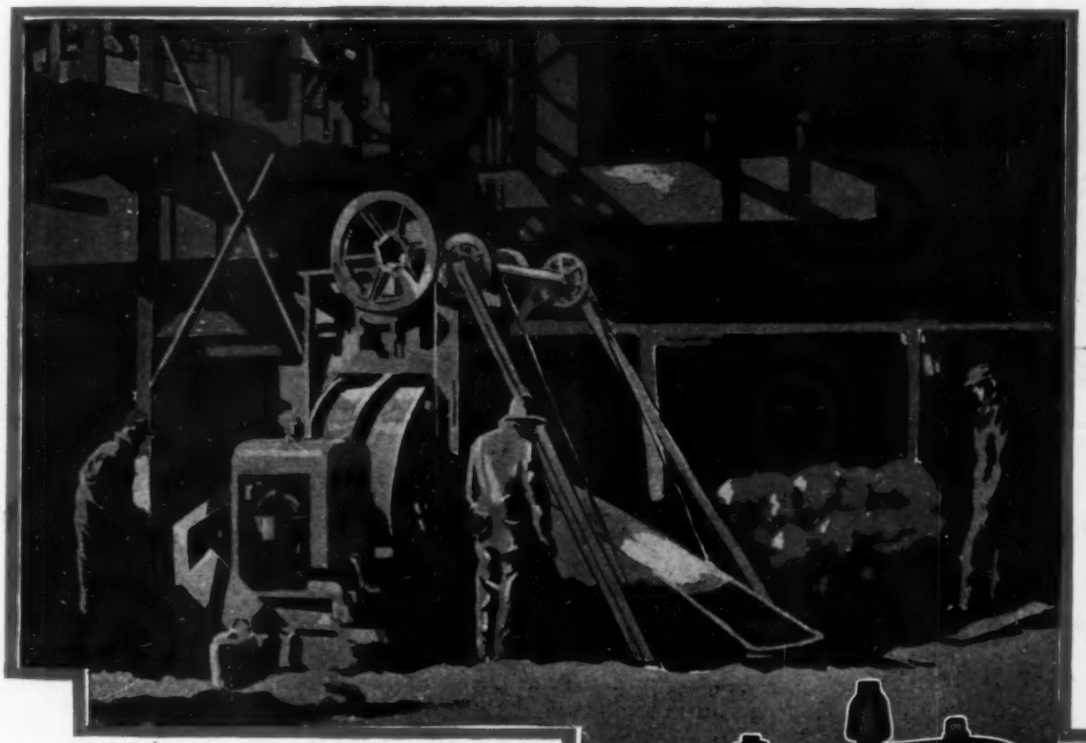
BETHLEHEM STEEL COMPANY *General Offices:* **BETHLEHEM, PA.**

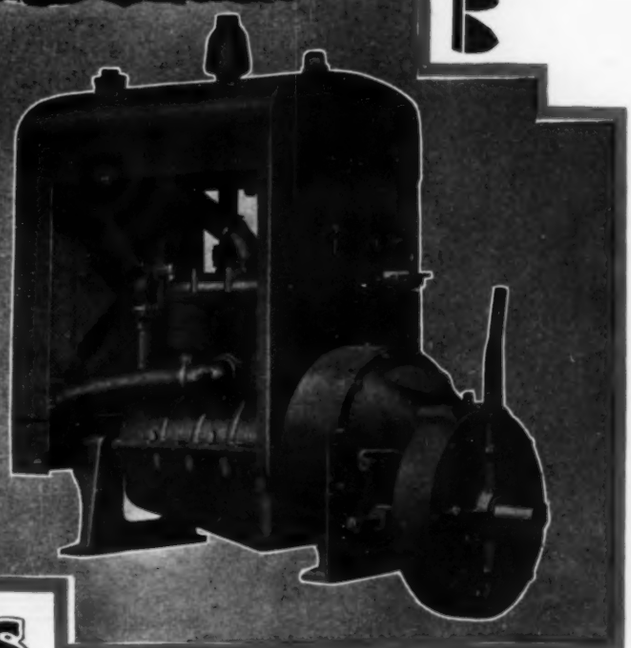
District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Detroit, Cincinnati, Chicago, St. Louis, San Francisco, Los Angeles, Seattle, Portland, and Honolulu.

Bethlehem Steel Export Corporation, 25 Broadway, New York City
Sole Exporter of our Commercial Products

DEPENDABLE.. POWER

AT LOWEST OPERATING COSTS



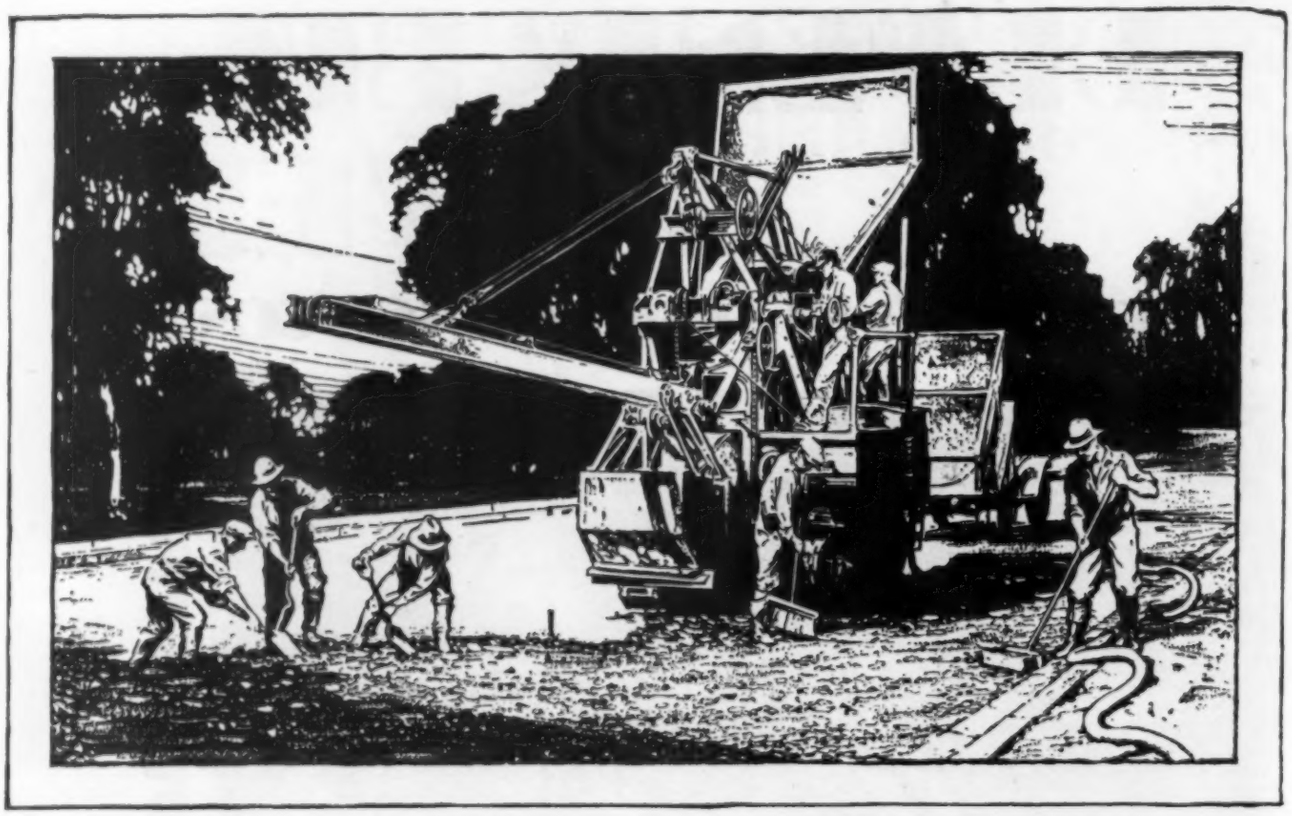


WHEREVER the Le Roi Engine is in service you find "life" every minute. It has that facility of keeping everlastingly at it—of giving *dependable power* . . . Contractors, the country over, tell us how the Le Roi Engine rolls up months of unbroken service—how it rarely takes *time-out* for itself . . . Besides, Le Roi's operating costs are lowest per day and per year. Know the Le Roi as others do!

LE ROI COMPANY
MILWAUKEE, WIS.
1930—Road Show—Atlantic City

LE ROI ENGINES

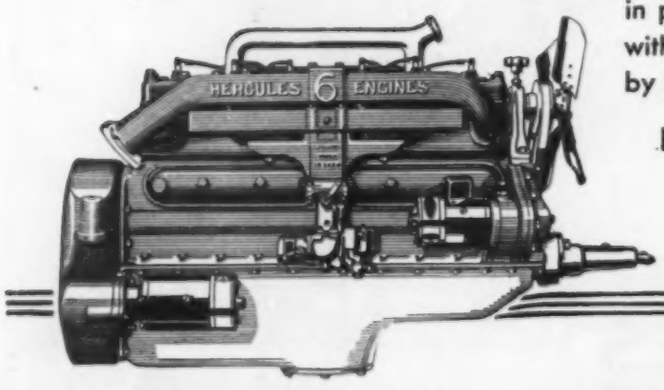
3 *to* 180 HORSE POWER



Mixed and Placed in Record Time By Hercules Powered Pavers

Churned in the maw of a Hercules Powered Foote Paver and quickly distributed by the traveling bucket, cement, aggregate and water are transformed into a concrete base for paving with magic-like dispatch. Logan Boulevard, Chicago, represents a typical job—paved and open to traffic in record time.

Hercules Engines do "bonus" work on heavy-duty road building machinery and other industrial equipment. Unexcelled in power, stamina and reliability, they perform with tireless efficiency—earn additional profits by their economy of operation.



HERCULES MOTORS CORPORATION
Canton, Ohio, U. S. A.

WEST COAST BRANCH: LOS ANGELES, CAL.
MID-CONTINENT BRANCH: TULSA, OKLA.

HERCULES ENGINES

the POWER OPERATOR coordinates every factor on the job

A new element in Paver speed

The MultiFoote Power Operator clips off the seconds lost in manual operation eliminating that loss of co-ordination that makes the mechanical mixing cycle impractical.

Write the nearest general agent.

THE FOOTE COMPANY, Inc.
of NUNDA, N. Y.
World's largest exclusive builders of road pavers

Frank E. Hall
152 W. 42nd St.
New York City.

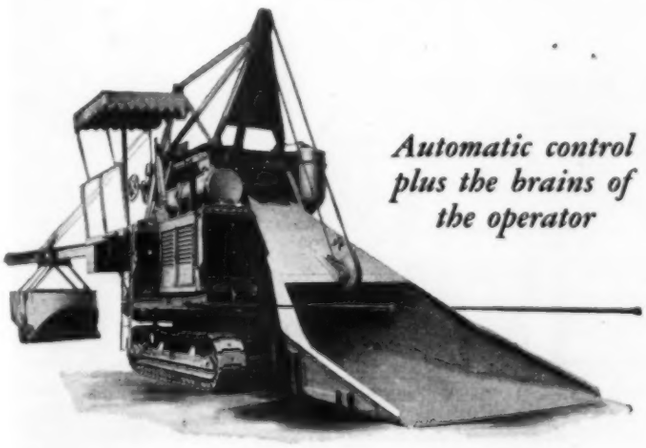
Wilcox Brothers, Inc.
588 Chenango St.
Binghamton, N. Y.

E. J. McHarg & Co.
31 Crestmont Rd.
Binghamton, N. Y.

MultiFoote Sales Company
2811 West Fulton St.
Chicago, Ill.

Burton Franklin
Volunteer Bldg.
Chattanooga, Tenn.

Edward R. Bacon Company
Folsom at 17th St.
San Francisco, Calif.



Automatic control plus the brains of the operator

See the 1929

MULTIFOOTE
The Paver with Timken Bearings

CM10Gray

Champion Super Service Group

CHAMPION SUPER SERVICE STEAM HOSE

CHAMPION JERSEY CREAMERY HOSE

CHAMPION ALL SERVICE WATER HOSE

CHAMPION SUPER SERVICE PNEUMATIC TOOL HOSE

REPUBLIC'S
5 Champions

The Super-Service Group

RESEARCH in the field and in the laboratory, infinite care in production and the use of only the best materials back up every Republic product. Republic mechanical rubber items are distributed through the Industrial Supply Distributor, the most direct, economical and efficient manufacturer's representative. Suppose you had to buy your stock from the manufacturers of the hundreds of products you use, see all their salesmen and record all the purchasing procedure? The distributor saves you all this trouble and expense. For better service and quality use Republic distributors.

THE REPUBLIC RUBBER CO.
Youngstown, Ohio

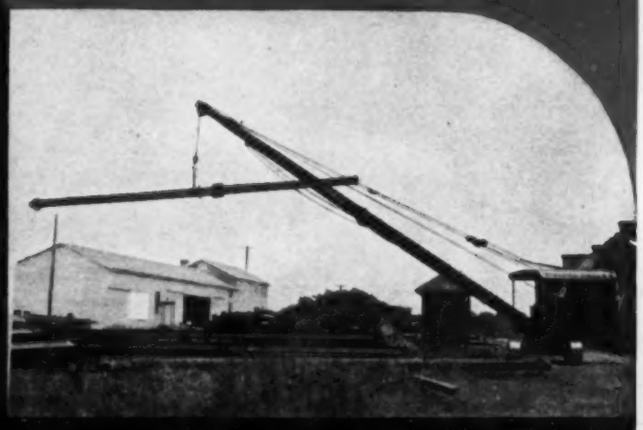
Belting - Packing - Hose
Molded Goods - Lathe Cut Goods

REPUBLIC means the Best Mechanical Rubber Goods

MONONGALIA COUNTY (West Va.) uses this ½ yd. Universal 35 to remove road slides and slips. Notice how far reach of the shovel boom permits casting on the far side of the road.

UNIVERSAL 35 owned by William Muirhead, Durham, N. C., unloading 900 tons of steel forms, girder and beams in ten hours.

When it comes to Close Figures— Count the UNIVERSAL-35 in on the job

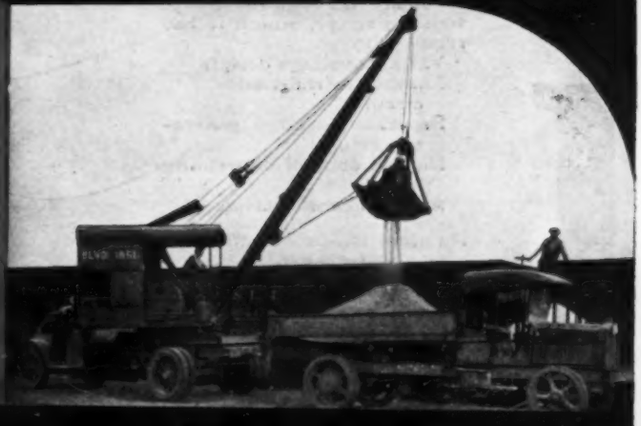


THIS fast stepping half yarder is big enough and powerful enough to handle a sizeable job alone. And it's small enough to be cheaply operated on clean up work around the big jobs. Use it with any type of boom equipment—shovel, crane, dragline, clamshell, skimmer scoop, backdigger. The correct boom equipment protects your profit margin on the closely figured jobs.

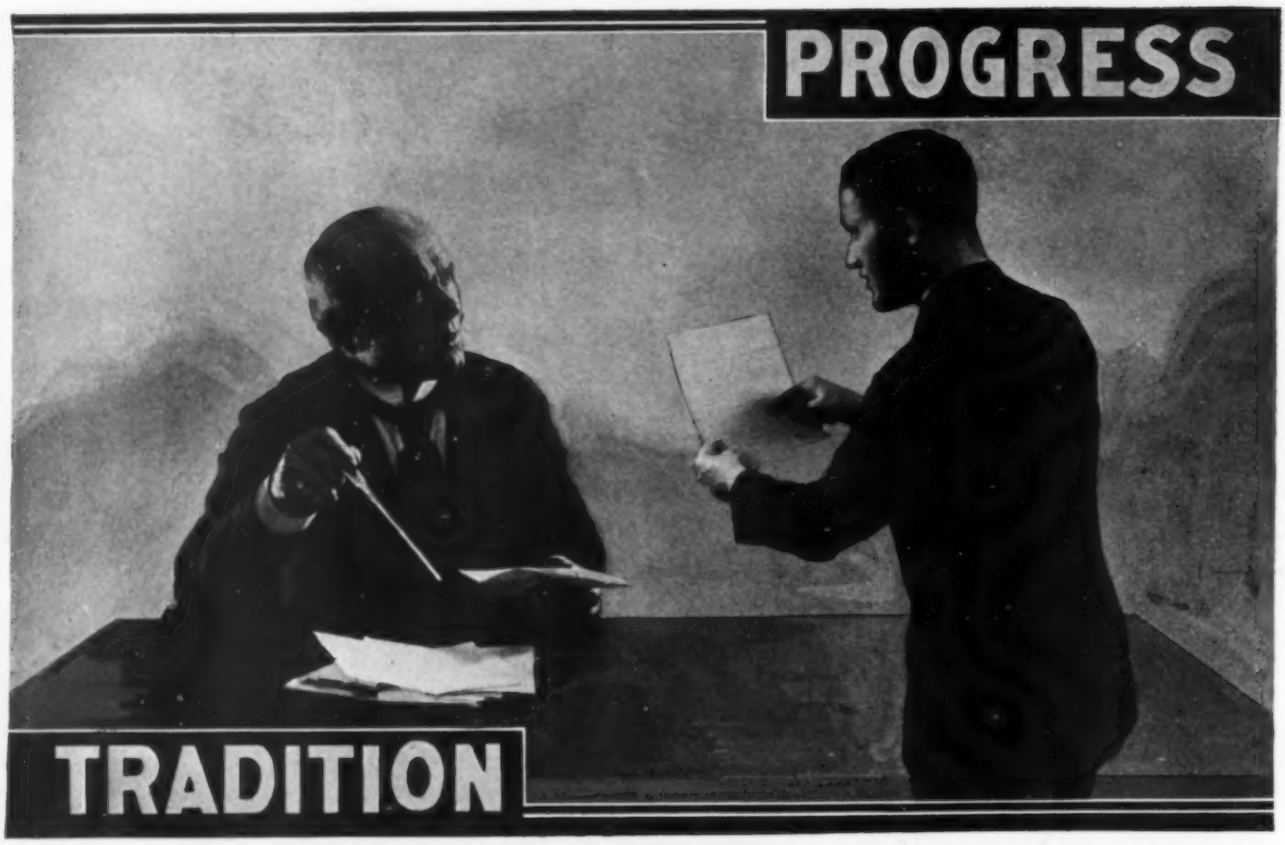
THE UNIVERSAL CRANE CO., *Lorain, O.*

UNIVERSAL 35 with backdigger boom, mounted on the famous 2 speed Center Drive Crawler. One of the two Universal machines owned by Coahoma County (Mississippi).

THE Universal 35 superstructure is readily transferable to motor truck mounting when quick mobility is required. Universal Truck Cranes are built in 5, 6, 7½ and 10 ton capacities.



UNIVERSAL-35



"Here, Lad—

I'm with you in getting a 'Stable-Arc' welder if you can show me that our prospective work on odd services in construction work will justify it."

The Lincoln "Stable-Arc" Welder

—welds easier
—makes better welds
—permits greater output because of the steady uniform arc throughout entire welding range, which is the result of:

- **Variable voltage design**
- **Laminated magnetic circuit**
- **Separately-excited generator field**
- **Double control of welding heat**
- **All steel construction**

No other welder has all these features.

"No, Pop—

that's impossible, because you want me to guess the future and our experience to get future business.

And the future will take in all metal joining services, if my guess goes.

I was just reading the report of the Pacific Coast Building Officials' Conference.

It shows where thirty-eight municipalities have incorporated in their building code a section covering the arc welding of buildings.

And various organizations in the Eastern Section have been at work for some time on a building code incorporating a section covering arc welding. When the news breaks, that business will go to those experienced in arc welding.

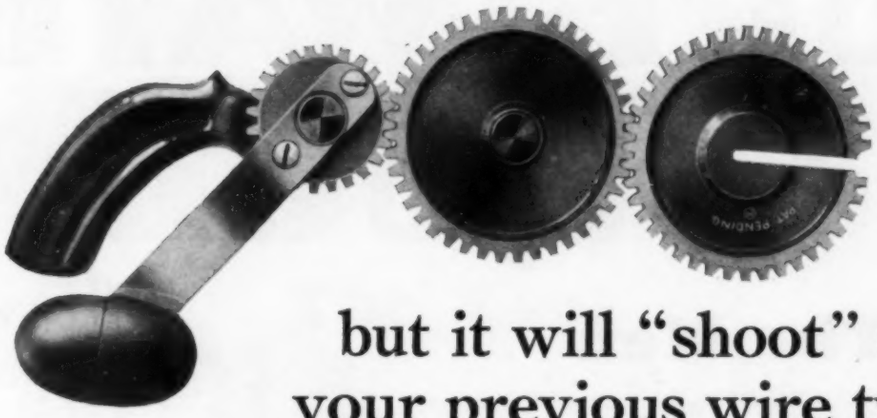
Our experience is never gained on work we're *going* to do."

The Lincoln Electric Co.
Dept. No. 32-10, Cleveland, O.

W-113

"Stable-Arc" LINCOLN WELDER

Not a Machine Gun—

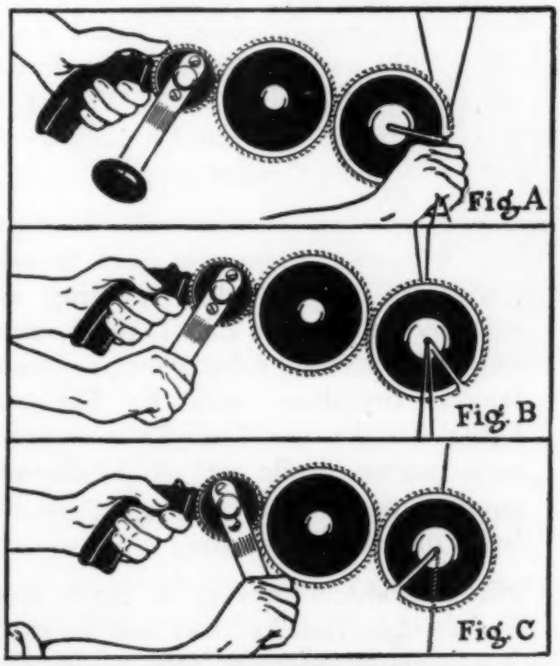


but it will "shoot" all your previous wire tying records to pieces!

Maybe you think you have a pretty fast form gang. Maybe they have set a few records up for you. But we are sorry to say that, unless they now use the Lightning Wire Twister, the old records are going to be shot to pieces.

Any man can use this new tool. It is as simple as A-B-C and it simply speeds up wire tying in a way that will set your head a-spinning! We don't ask you to take our word for it. All we want is a chance to prove it—in your office or on your job. (We can demonstrate this tool anywhere.)

How it works—
Read simple instructions below



"The Lightning Wire Twister"

The above illustrations show how simple the Lightning Wire Twister is. The comfortable, pistol-grip handle is held in the left hand. The wires are inserted as shown in Fig. A. Then the crank is turned with the right hand in a clock-wise direction, as shown in Fig. B, until the wires are taut. Release the right hand from the crank and remove the twister with the left hand.

If you will do us the favor of sending in the coupon below—we will do you the favor of letting you know more about this tool—which will save its low price in a few days on any form job.

Give yourself a "break"; shoot us the coupon now! You will never regret, we promise you that!

Use this coupon—NOW!

Gentlemen:—Send me your proof. I'm willing to be shown how to save money on wire-tying.

Name .....

Address .....

Mail today to

The Royson Mfg. Co., Inc.
Springfield, Mass.

PURE WATER & QUEENS

The Men

PATRICK McGOVERN—the man who masters seemingly impossible engineering problems—has started on a tunnel twenty-two miles long that will double the supply of pure water for New York City's six million.

Thirty-eight years ago, Pat McGovern—a brawny lad having an uncanny knack with a pick—left County Cavan in North Ireland and came to America. Landing 'broke' he immediately got a job as a day laborer at $1.75 a day. He has been working ever since, and has just recently won the contract for his latest big job—a forty-two million dollar project.

AND

JOHN S. MACDONALD, youngest chief engineer and tunnel specialist, was engineer on the New York Barge Canal, Fort Point Channel Tunnel at Boston, Twin Tunnels under East River at New York, 14th Street Subway System at New York, and the Causeway Bridge over Jamaica Bay, New York.

He was chief engineer on the twenty-six million dollar subway section in Philadelphia, the 53rd Street Tunnel in New York, and now as a crown to his many engineering monuments, he—as Vice President of the McGovern interests—will be chief engineer on this huge project.

22 MILES

The Job

A tunnel twenty-two miles long, seventeen feet inside diameter, and eight hundred feet deep through solid rock to carry enough pure Catskill water from Yonkers to Brooklyn to double the supply throughout New York City and to insure its continuous flow—a forty-two million dollar project.

A huge conduit to carry millions of gallons of water under the deep foundations of New York's towering sky scrapers—under the I. R. T. tubes rumbling with speeding subway trains—under famous Broadway with its life and lights—under the East River crowded with marine traffic of all kinds, and coming to the surface again in the heart of busy Brooklyn.

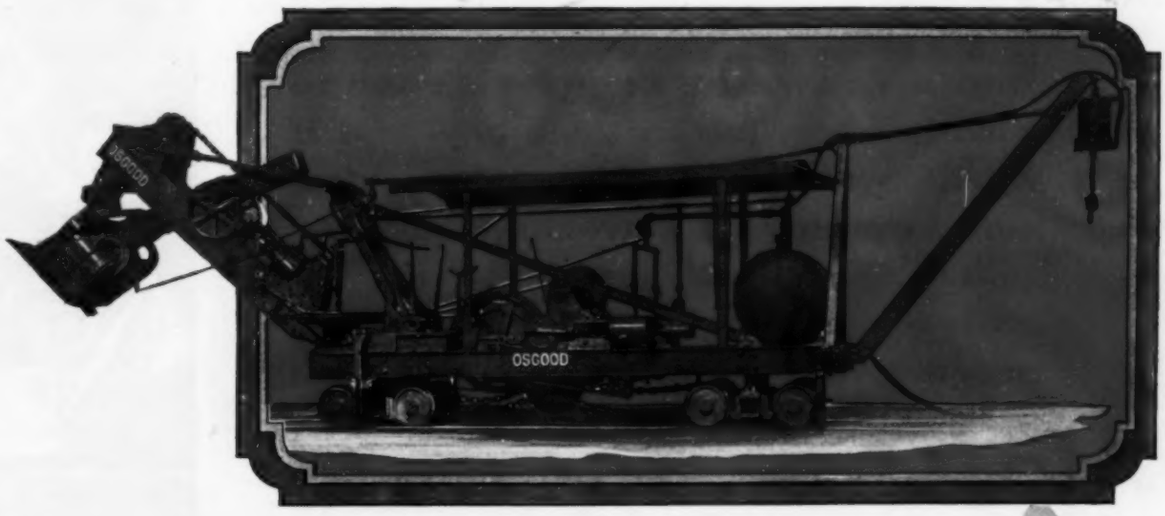
Nineteen shafts varying in depth from five to eight hundred feet will be sunk. Three thousand men will be lowered down the shafts daily to bore this underground river.

for BROOKLYN BOROUGH

The Tool

Faced with the need for a shovel heavy enough to do rock excavating yet work within the tunnel diameter of nineteen feet, it remained for engineers of the Osgood Company, Marion, Ohio, with more than a half century of continuous experience in the design and construction of excavating machinery, to develop the shovel that met the exacting requirements of Mr. McGovern.

A standard Osgood 43, railroad type shovel, which had proven its

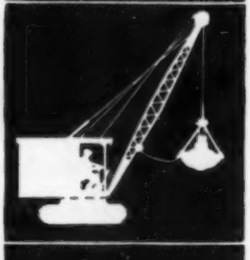


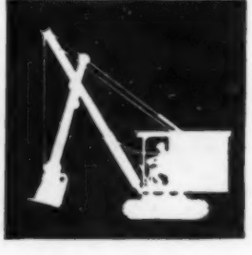
ability on tunnel work under severe conditions, was adapted for work on this project by equipping it with a special low A-frame, an armored boom and dipper handle, and a two-piece rock type dipper with manganese steel front which was especially designed to meet the approval of McGovern's engineers. Each shovel is equipped with a jib crane and air hoist for transferring empties from the incoming track to the loading track, making it possible to take a loaded car from the shovel in less than twenty seconds.

Compressed air is supplied to the shovel from plants located on the surface.

22 of these OSGOOD SHOVELS will be used on this job!

TRUCK
CRAWLER
LOCOMOTIVE
CRANES





Put a Browning Crawler Crane to work on *any* job . . . see how fast it works, watch how easily it operates, note how smooth it works where the going is tough . . . and then you will understand why you can do more productive work at a lower cost with a Browning.

THE BROWNING CRANE COMPANY
16226 Waterloo Road
CLEVELAND, OHIO, U. S. A.
***Branch Offices:* NEW YORK, N. Y., CHICAGO, ILL.**

DISTRIBUTORS

Portland Los Angeles New Orleans Chicago Montreal Toronto Albany Buffalo Syracuse Boston Minneapolis Birmingham San Francisco Philadelphia Indianapolis Detroit Toledo, Ohio Tacoma Canton, Ohio St. Louis Charlotte, N. C.

BROWNING CRANES

A SET OF

BLAW-KNOX STEEL FORMS

built - - -

and good for many more seasons of work

FIFTEEN YEARS of hard service from any piece of construction equipment is *some* performance.

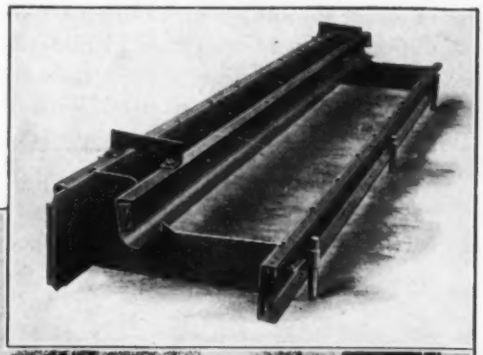
J. Rasmussen & Sons, Oshkosh, Wisconsin, are at present using 2,000 ft. of Blaw-Knox Steel Curb and Gutter Forms which have rendered continuous service since originally bought in 1914.

More than *one million lineal feet* of concrete curb and gutter have been formed with this equipment.

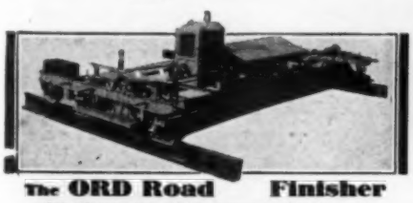
This original set of forms is still *intact*—which proves that there is practically no wear-out to Blaw-Knox Steel Forms.

You can also benefit by the economy of STEEL FORMS—BLAW-KNOX Steel Forms for all types of curb, curb and gutter, integral base and curb, and sidewalk construction.

Send for a copy of Catalogue No. 1107—BLAW-KNOX Steel Forms. *Use the Coupon.*



J. Rasmussen & Sons are using a form setting crew of three men—building an average of 1300 lineal feet of curb and gutter every day.



The **ORD Road Finisher**
—It's the double sliding screed that does it.

BLAW-KNOX

BLAW-KNOX

BLAW-KNOX COMPANY
686 Farmers Bank Bldg., Pittsburgh, Pa.

Send me a copy of your Bulletin No. 1107 —Blaw-Knox Street and Sidewalk Forms.

NAME .....
COMPANY .....
STREET .....
CITY ..... STATE .....

Balanced Angle Compressors help erect largest building in British Empire

Contractor shows how *Balanced Angle* compressors reduce equipment investment — and combine *lowest cost air power* with portability.

A way to increase profits on building contracts—was pointed out in the erection of the new Eaton Building in Toronto.

Instead of backing up the riveting guns with several portable air compressors—the contractors used one Balanced Angle Compressor, mounted on two 10 x 10 timbers.

Obviously, the investment in compressor equipment was substantially less. But, in addition, the contractors secured the low-cost air power of Balanced Angle Compressors—without sacrificing the advantages of portability.

A few hours after the compressor reached the job, it was running smoothly, with only a couple of timbers for foundation. It was operated 24 hours daily, until completion of the work, without a moment's trouble. Since then the compressor has been used with the same simple skid foundation, on two other contracts.

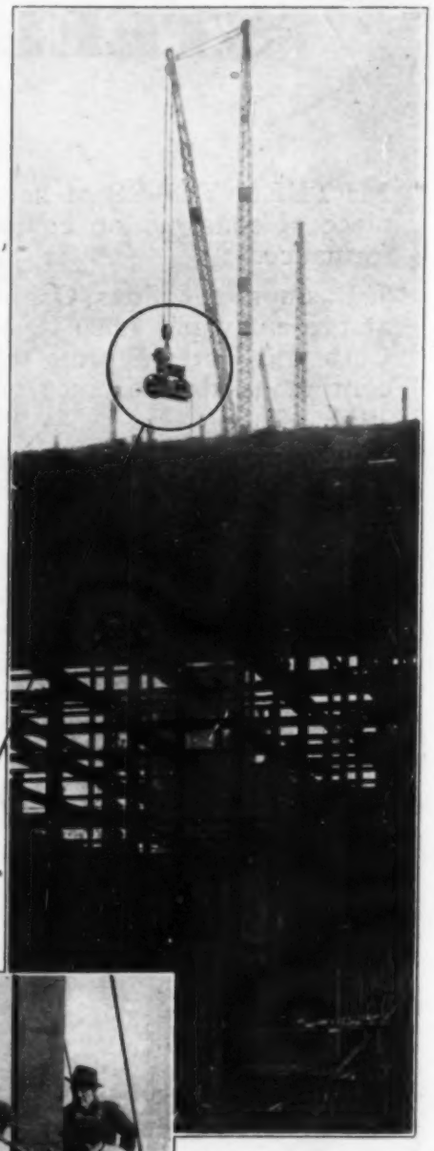
Smooth operation made possible by Balanced Angle design saves foundation cost, power, and maintenance. Yet, it is only one reason why these compressors are saving money for leaders in every industry.

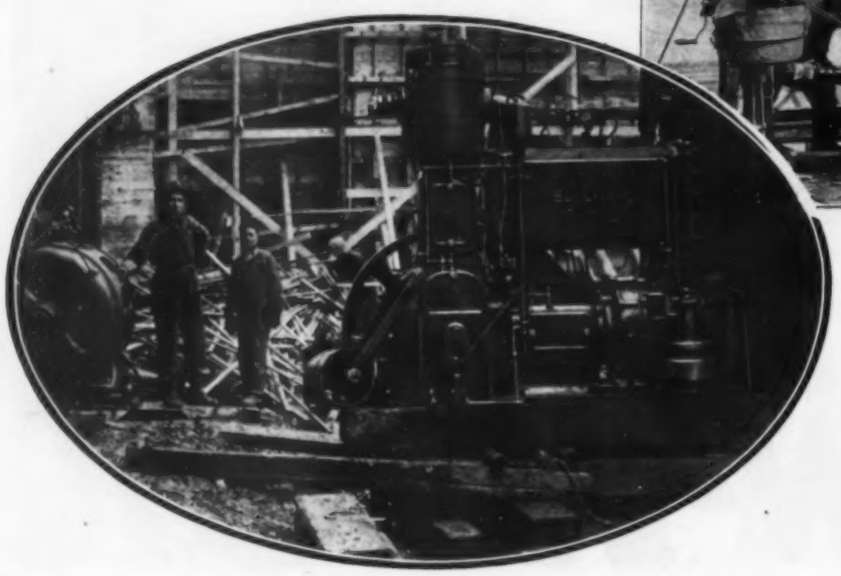
Send for Catalog 83-J

Sullivan Machinery Company

816 Wrigley Bldg., Chicago

Offices in all principal cities of the world





At left: The Sullivan Compressor is being moved out of the shed after completion of work on the Eaton building. The timbers which have been its only foundation, are still attached. *Above:* On completion of the job, the compressor was hoisted up one side of the building, and let down the other side to a motor truck, which hauled it to another job.

BALANCED ANGLE COMPOUND SULLIVAN

Leaders in every industry are saving money with Sullivan Air Compressors

VERSATILE

..the result of advanced Engineering

FROM the radiator right through to the drawbar hook, the Allis-Chalmers Monarch is completely MODERN in design.

Its powerful new-type motor runs steadily—sweetly—through the hardest work without overheating. The long surefooted tracks swing the tractor around in its own radius. Easy-working steering clutches and truck-type steering wheel permit the operator to do his work easily, naturally, and safely. He watches the course ahead and the operations behind without discomfort or fatigue. He gets more work done in less time.

Monarch "50" and "75" owners are consistently finishing jobs in less than contract time. Hauling 42" elevating graders through stubborn soil — pulling 10-yard wagons heaped high with heavy clay—easily moving 4 or 5 loaded Maney scrapers — these are easy jobs for the Monarch "75" — the "50" has power in proportion. Write for complete details and prices.

ALLIS-CHALMERS MFG. CO.

Specialists in Power Machinery Since 1846

Monarch Tractors Division SPRINGFIELD, ILL.

Allis-Chalmers

Monarch Tractors

EVERY AMES BLADE IS HEAT TREATED

More AMES SHOVELS are used than any other kind

The complete "All Star" Ames Line covers every shovel need.
It will pay you to "Look for the Stars" on every shovel you buy.

AMES SHOVEL AND TOOL COMPANY
NORTH EASTON ◂▸ MASSACHUSETTS
ST. LOUIS, MISSOURI - - - ANDERSON, INDIANA

3228

"SAY, Frank, what kind of a hoist are you using on the bank job?"

"Why, George, that's a Thomas. We had electric current available and put in an electric hoist."

"I've heard lots about Thomas hoists, Frank. What about them? Are they expensive?"

"Well, George, one of our superintendents suggested Thomas Hoists to me and urged me to look into them. Up to then, I always figured a hoist was a hoist. As I remember it, we paid a little more—not very much—for a Thomas. We did it to keep peace in the family. I am glad now that we did. It's the best hoist we ever had. The upkeep is nothing and there is no time out for repairs. We need a gasoline hoist for the Telephone job and you can bet it will be a Thomas. I've never used one, but a friend of mine told me they build the only real gas hoist on the market."

"Thanks, Frank, I'll bear that in mind. I'm afraid that old steam rig of mine won't go through another job. So I'll have to get in touch with Thomas."

"Thomas Users are Thomas Boosters"

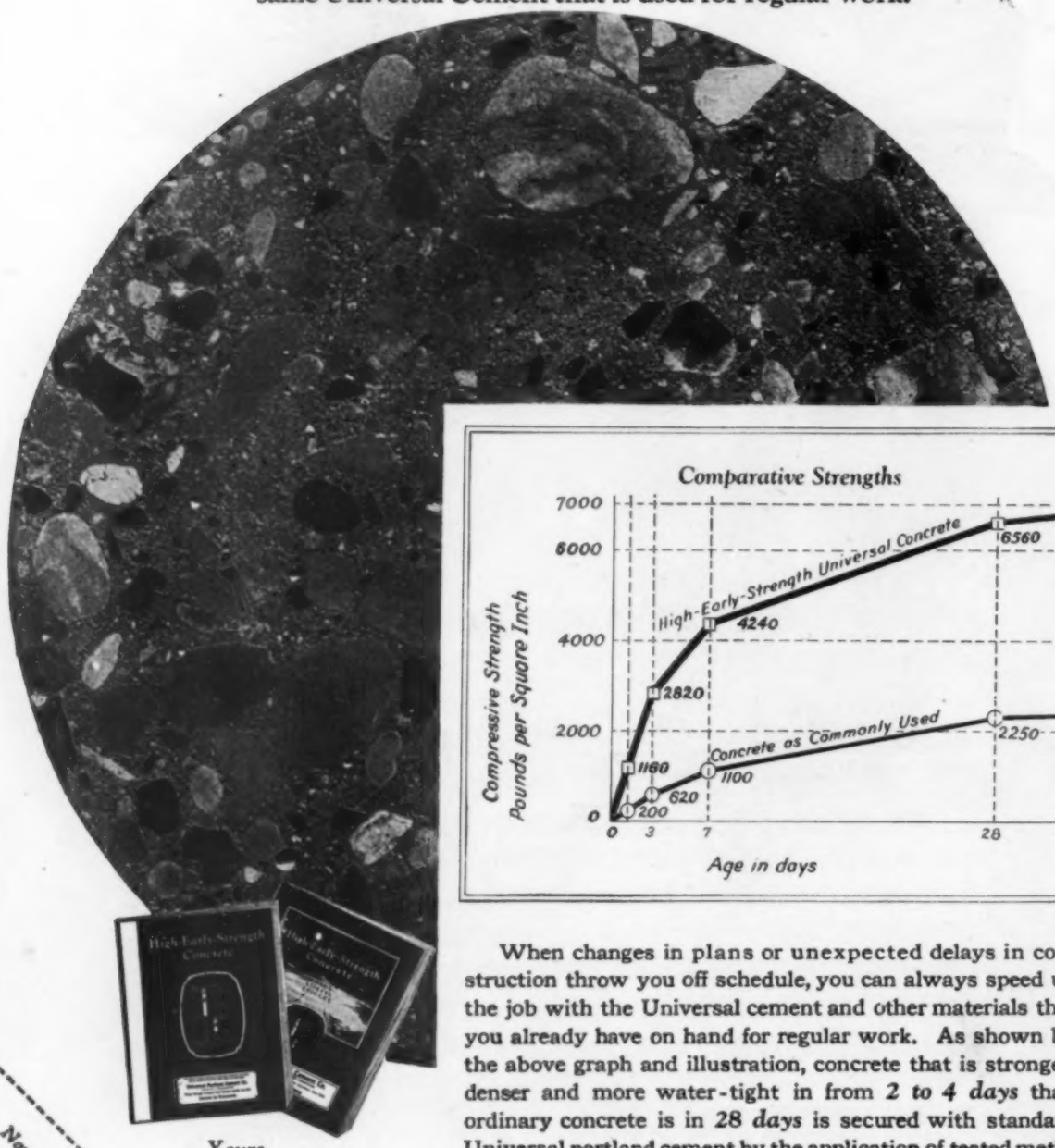
THOMAS ELEVATOR COMPANY

20 SOUTH HOYNE AVENUE .

CHICAGO ILLINOIS

Right at Hand!

This high-early-strength concrete was made with the same Universal Cement that is used for regular work.



Yours for the asking!

When changes in plans or unexpected delays in construction throw you off schedule, you can always speed up the job with the Universal cement and other materials that you already have on hand for regular work. As shown by the above graph and illustration, concrete that is stronger, denser and more water-tight in from *2 to 4 days* than ordinary concrete is in *28 days* is secured with standard Universal portland cement by the application of tested methods. Description of these methods for obtaining *High-Early-Strength Universal* Concrete will be furnished on request. Just mail the coupon for either or both of the booklets. There is, of course, no obligation.

Name _____

Address _____

Universal Portland Cement Co.
208 So. La Salle Street, Chicago

Without obligation, please send me the following booklets:

☐ *High-Early-Strength Concrete*
☐ General Building Edition
☐ Paving Edition

CM 10-29

Universal Portland Cement Co.

Subsidiary of United States Steel Corporation

Chicago Pittsburgh Minneapolis Duluth Cleveland Columbus New York

Concrete for Permanence

Construction Methods

A McGraw-Hill Publication—Established 1919

ROBERT K. TOMLIN, *Editor*

VOLUME 11 NEW YORK, OCTOBER, 1929 NUMBER 10

SUPERSTRUCTURE FALSEWORK of steel trusses carries hanger rods on which are suspended the forms for reinforced concrete arch railroad bridge.

Arch Forms for Bridge HUNG FROM STEEL TRUSSES

AT FIRST glance, the steel trusses in the photograph look like part of an old bridge being used to support the forms for the concrete arch structure which will supplant it, or they might be parts of a new bridge. As a matter of fact, the trusses are temporary falsework structures designed and erected just for the work they are performing—carrying the forms for a concrete arch on hanger rods. The concrete bridge is a massive railroad structure, and the falsework trusses were made proportionately heavy to carry the arch during construction.

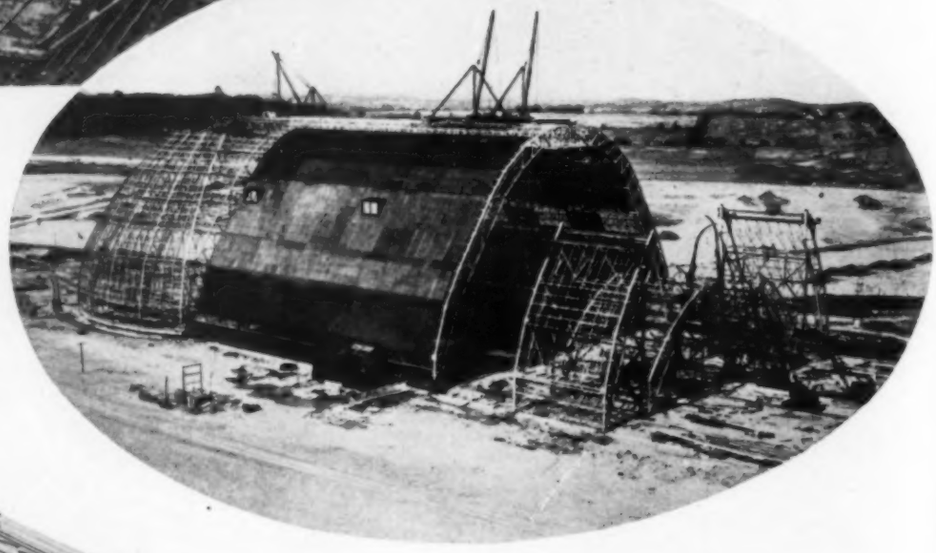
For the Pennsylvania Railroad the Dravo Contracting Co., of Pittsburgh, is building the bridge across the Schuylkill River, Philadelphia, to carry the company's electrified suburban tracks. Temporary steel superstructure falsework was adopted by the engineers and contractors after a consideration of the usual substructure falsework had shown the latter to be impracticable. It was deemed inadvisable to obstruct the channel of the river, even though the stream no longer is used extensively for navigation above the bridge. In addition, the great depth of silt on the bottom of the river would have made the cost of long piling excessive.

Steel trusses to carry the forms on hangers, therefore, were chosen as the more advantageous type of falsework. As the photograph shows, the trusses rest on steel columns erected on the piers, and the beams supporting the arch forms are hung on steel rods from the trusses.

This Month's

SHEATHING AND SIDING operations *(below)* are started on world's largest airship factory and dock under construction by Goodyear-Zeppelin Corp. at Akron, Ohio. The huge structure, a semi-paraboloid in shape, is 1,175 ft. long, 325 ft. wide, 211 ft. high, with a floor area of 364,000 sq.ft. A 100-ft. wide strip at the top of the roof is protected with Insulite and the sheathing for the sides consists of Robertson asbestos-protected metal secured to the steel framework by positive fastenings.

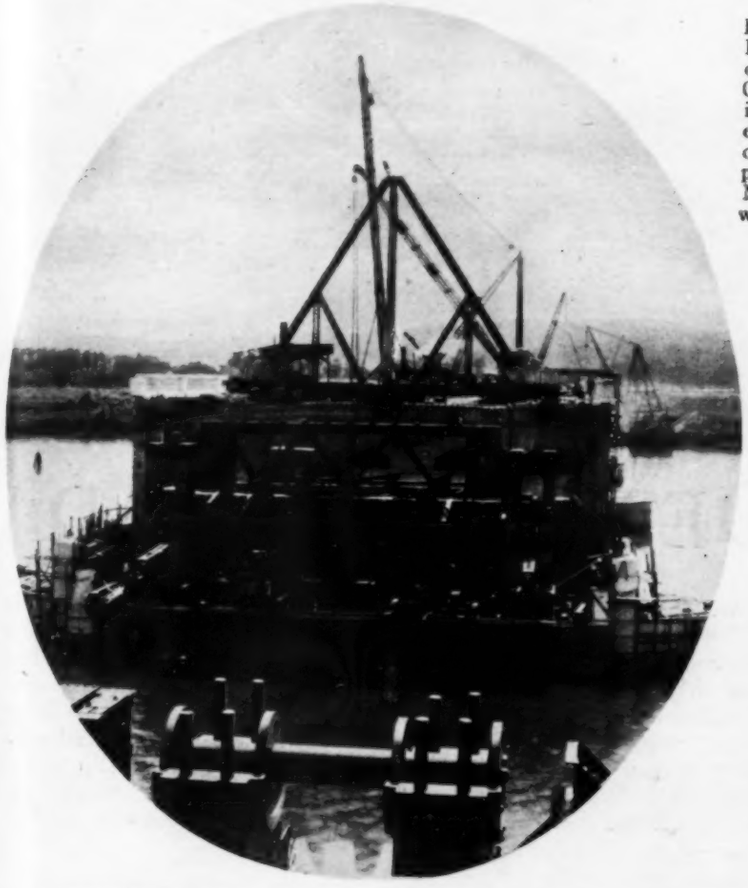
LINING a portion of the 26-mile Kittitas Canal which will deliver water for irrigating the U. S. Bureau of Reclamation's Yakima project, located in Washington. Concrete for the 3-in. reinforced coating is chuted to place from a hopper on a motor truck. Side slopes are concreted simultaneously, working from the bottom up.



CABLE CONNECTIONS *(below)* are made by John A. Roebling Sons Co. between the 600-ft. towers of the Hudson River suspension bridge with a span of 3,500 ft. connecting New York and New Jersey.

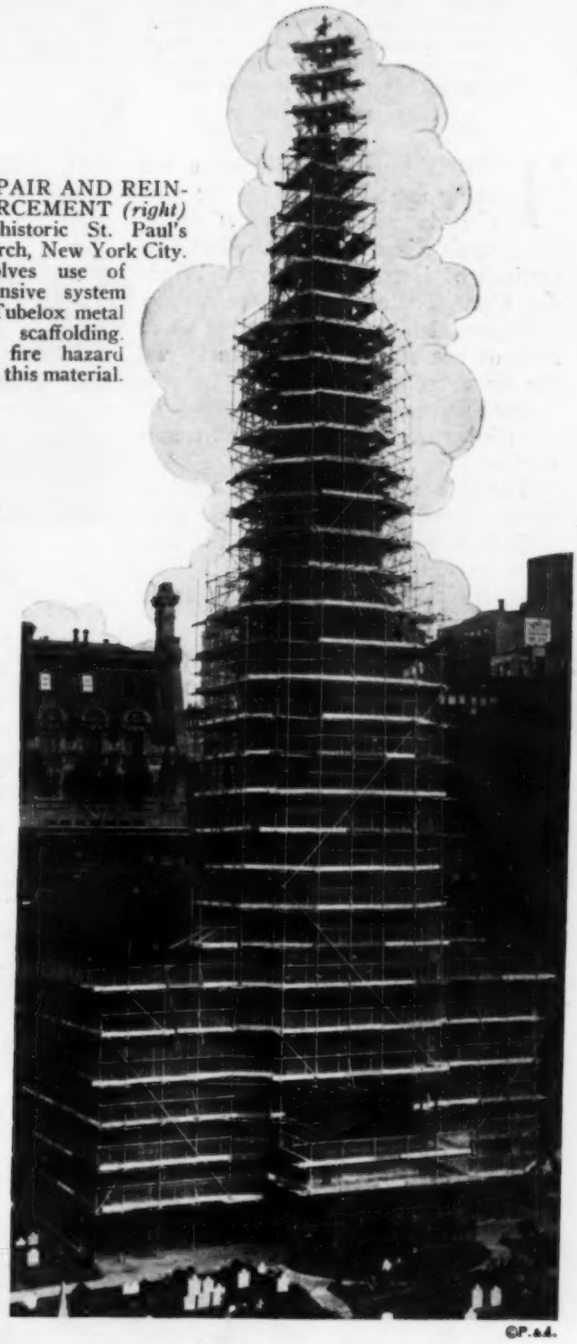
©Herbert

"News Reel"



TRUNNION POSTS and trunnion trusses placed by Phoenix Bridge Co. for drawspan of Arlington Memorial Bridge across Potomac River at Washington, D. C. The Hunkin-Conkey Construction Co. of Cleveland is contractor for superstructure.

REPAIR AND REINFORCEMENT *(right)* of historic St. Paul's Church, New York City, involves use of extensive system of Tubelox metal pipe scaffolding. No fire hazard with this material.



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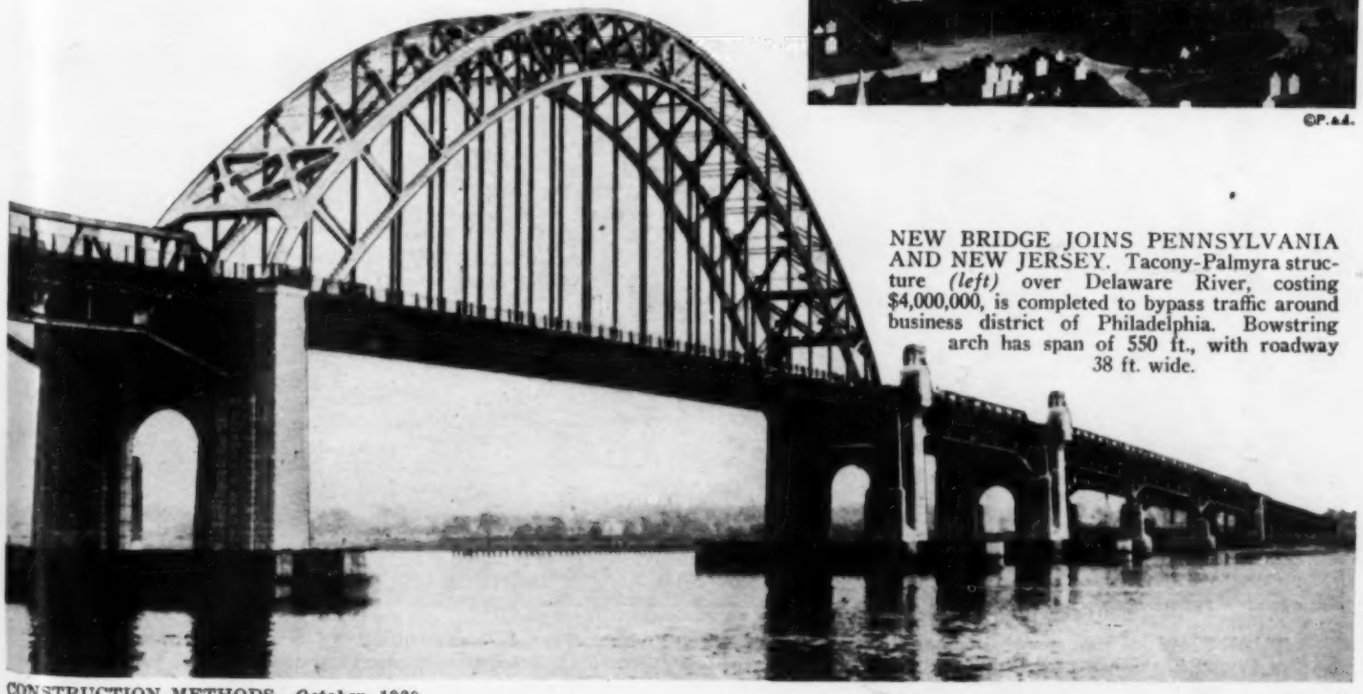


NEW BRIDGE JOINS PENNSYLVANIA AND NEW JERSEY. Tacony-Palmyra structure *(left)* over Delaware River, costing $4,000,000, is completed to bypass traffic around business district of Philadelphia. Bowstring arch has span of 550 ft., with roadway 38 ft. wide.

TUBE SEGMENT, in slip after launching, is concreted from 1-yd. plant alongside. Concrete is chuted from tower to hopper mounted on segment. Hopper feeds cable car.

Tube Segments, Sunk to Place, DETROIT-CANADA

THREE types of construction are being used to build the Detroit-Canada vehicular tunnel under the Detroit River between the business sections of Detroit, Mich., and Windsor, Ont. The approaches are subway structures, built in open cut; the shore sections are shield-driven tunnel; and the subaqueous tube consists of preformed segments placed in position by what is known as the trench and tremie method.

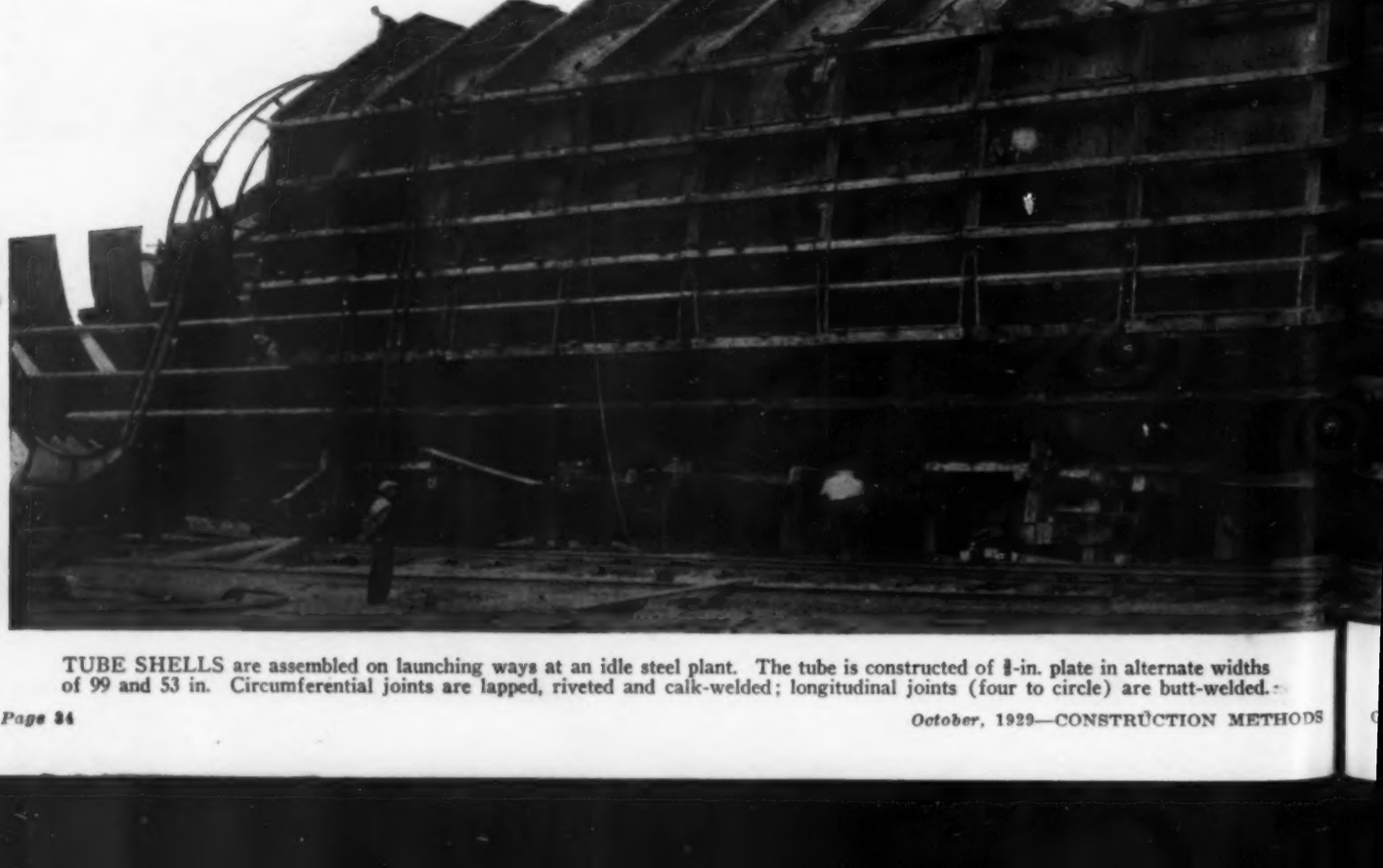
The plan, profile and tunnel sections show the main features of the tube. This article deals only with the subaqueous tunnel. Next month's *Construction Methods* will describe the shield-driven tunnel.

River Section—The subaqueous tunnel, 2,454 ft. long, consists of ten segments, one being 220 ft., eight 248 ft., and one 250 ft. in length. These segments, as the cross-section indicates, are steel plate shells 31 ft. in diameter, jacketed inside and out with concrete.

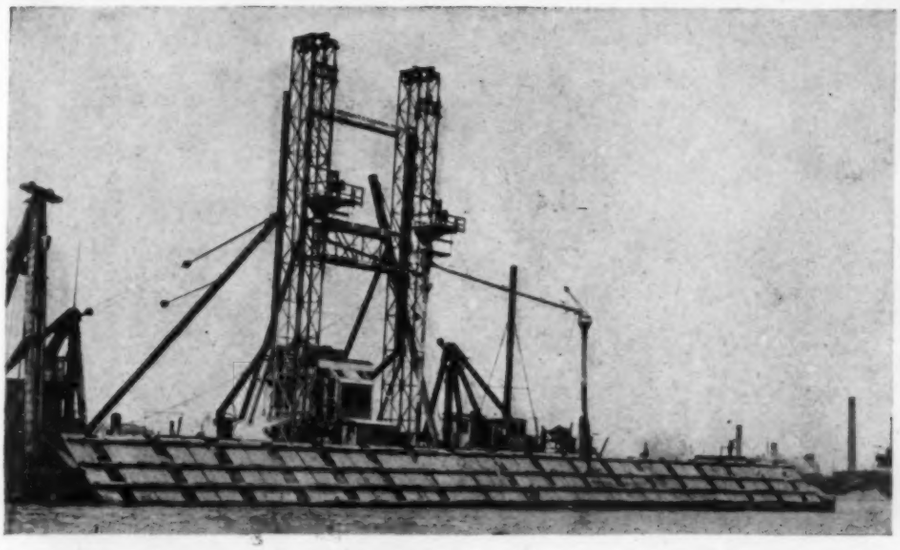
The tube shells are assembled on launching ways at an idle steel plant 4 miles down the river from the tunnel. Steel plate is received in quadrants 99 in. and 53 in. wide, and the tube is constructed of alternate widths. Circumferential joints are lapped, riveted, and calk-welded, and longitudinal joints are butt welded, the edges of the plates being beveled to receive the welding metal from the outside.

The steel contractor assembles a tube segment on the launching ways in 16 days. Five operators complete 3,832 ft. of calk welding and 1,000 ft. of butt welding in about 18 days, using approximately 3,000 lb. of $\frac{5}{32}$- and $\frac{3}{16}$-in. welding electrode. Six welding machines, three General Electric and three Lincoln, are kept on the job.

Before launching, each segment is made watertight at both ends by means of bulkheads braced by trusses. The bottom form and the two 45-deg. side forms are placed while the tube is on the ways. Segments are launched sideways and are towed to a slip where the interior concreting and part of the tremie concreting is completed. When



TUBE SHELLS are assembled on launching ways at an idle steel plant. The tube is constructed of $\frac{3}{8}$-in. plate in alternate widths of 99 and 53 in. Circumferential joints are lapped, riveted and calk-welded; longitudinal joints (four to circle) are butt-welded.



TREMIE CONCRETING is continued by floating plant, after tube has been moored near final location, until segment is awash, when scows for lowering operation are placed over it.

Form River Section of HIGHWAY TUNNEL

launched the tube draws about 7 ft. of water.

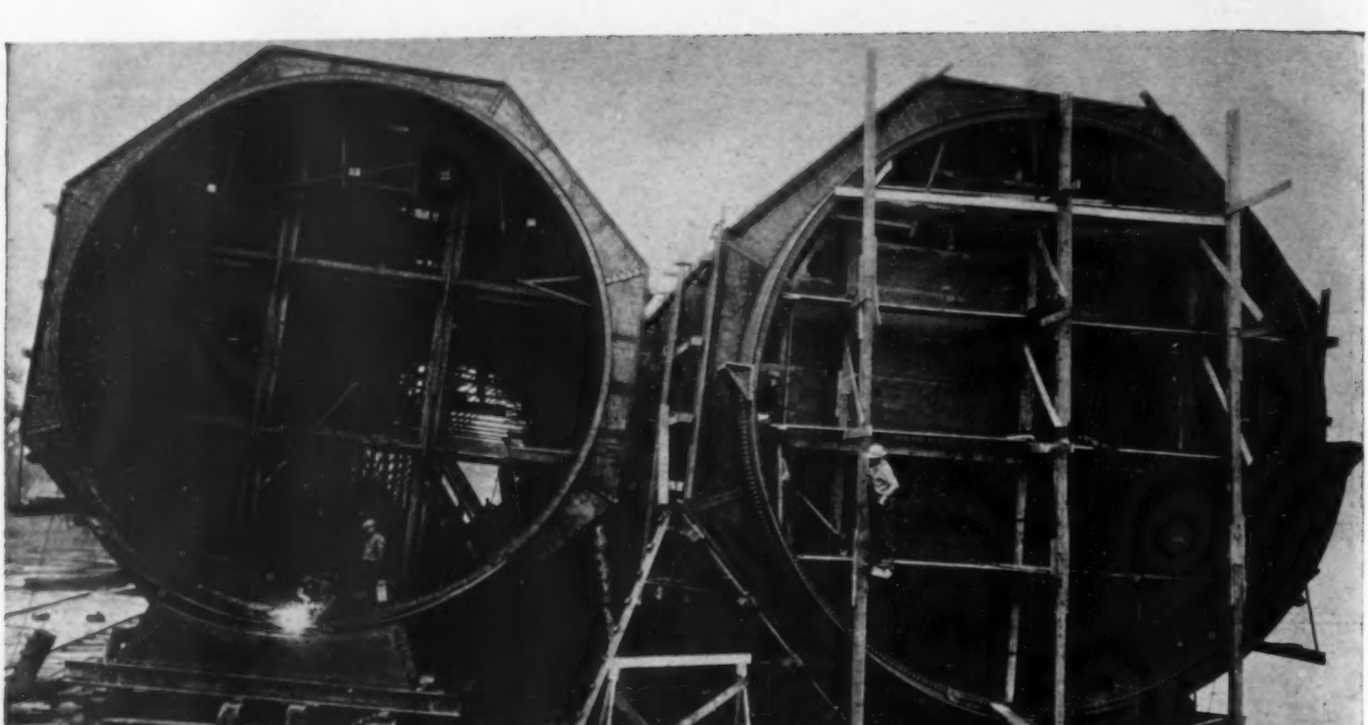
First Concreting Operation—Forms for the 18-in. interior lining are steel plate panels 4 ft. square. The panels are held at the corners by tie screws hooked to the bars which pass through the ring angles.

Openings 4 ft. square are left in the top of the segment for concreting the interior. A car running on an endless cable takes the concrete from the hopper mounted on the tube segment and distributes it to all parts of the interior by means of elephant trunk chutes through the openings in the shell.

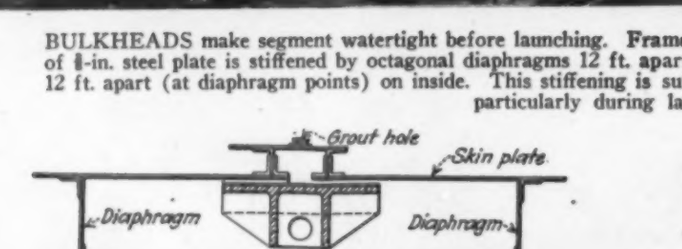
The road slab and supporting haunches are completed as close to the bulkheads as possible. Approximately 1,500 cu.yd. of concrete is placed on the inside of the tube, and an additional 450 cu.yd. of tremie concrete is deposited in the bottom of the outside form to act as a keel in towing.

With lining, roadway, and keel concrete in place, the segment draws 23 ft. of water. Tugs tow it from the slip to an up-and-downstream mooring alongside five dolphins in 40 ft. of water adjacent to the trench. Placing of tremie concrete is continued from a floating mixing plant in such a way as to keep the segment on even keel until

OCTAGONAL DIAPHRAGMS are made up of ⅜-in. plate reinforced at the outer edge with angles and riveted to the steel shell. They serve two purposes, both stiffening the tube and also supporting the outside form.



BULKHEADS make segment watertight before launching. Frame of double angles in tube at left is part of bulkhead truss. Shell of ⅜-in. steel plate is stiffened by octagonal diaphragms 12 ft. apart on outside and by ring angles 4 ft. apart and bracing spiders 12 ft. apart (at diaphragm points) on inside. This stiffening is sufficient to prevent distortion during all construction operations, particularly during launching of shell.

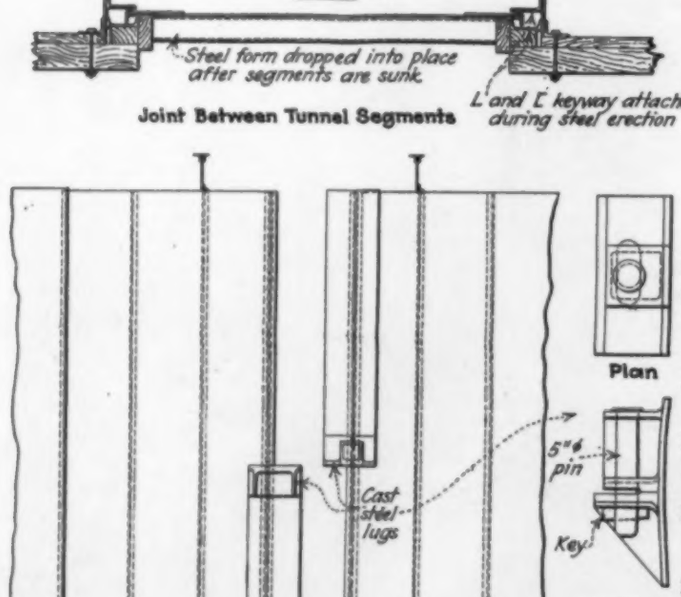


Joint Between Tunnel Segments

STEEL PLATE FORMS (*left*) for sealing joint with tremie concrete are placed by divers. Special grouted seal is completed on inside before applying 18-in. lining over joint.

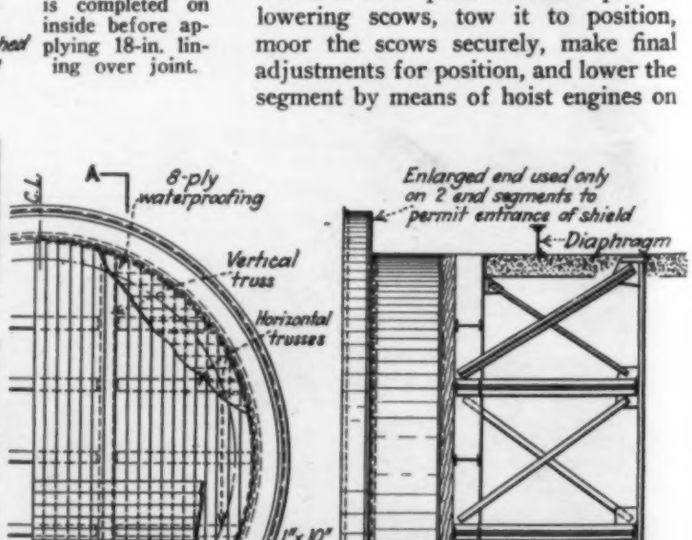
it is awash. Divers inspect the forms and the concrete during all tremie operations.

Lowering Method — The general method of placing the segment in the trench is to suspend it from a pair of lowering scows, tow it to position, moor the scows securely, make final adjustments for position, and lower the segment by means of hoist engines on



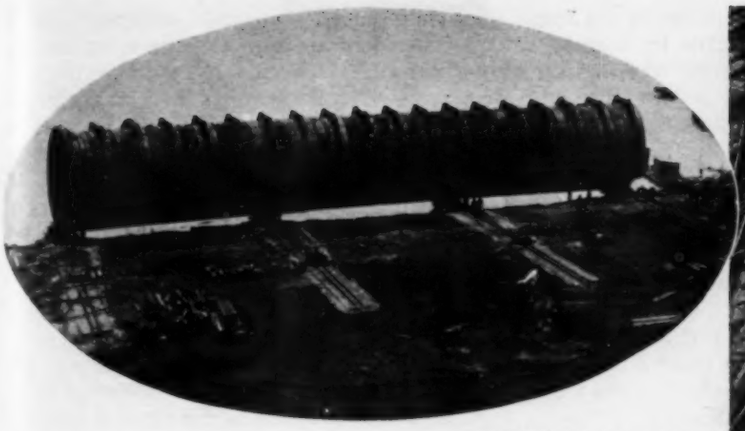
Typical Connection Between Segments

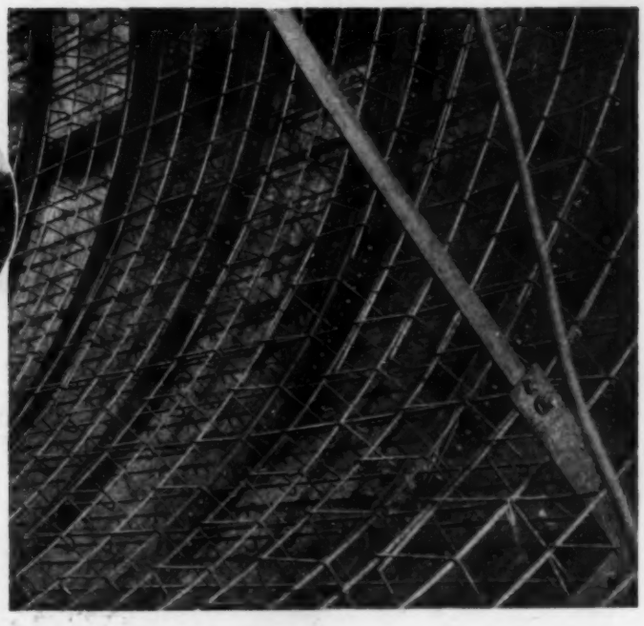
TO CONNECT SEGMENTS, projecting steel plates are fitted with cast steel lugs through which 5-in. pins are dropped. Note lugs on tube at right in photograph above.



Section A-A

BULKHEAD and bracing truss which transfers main bulkhead thrust to concrete lining of tube. Note enlarged end for connection with shield-driven tunnel.



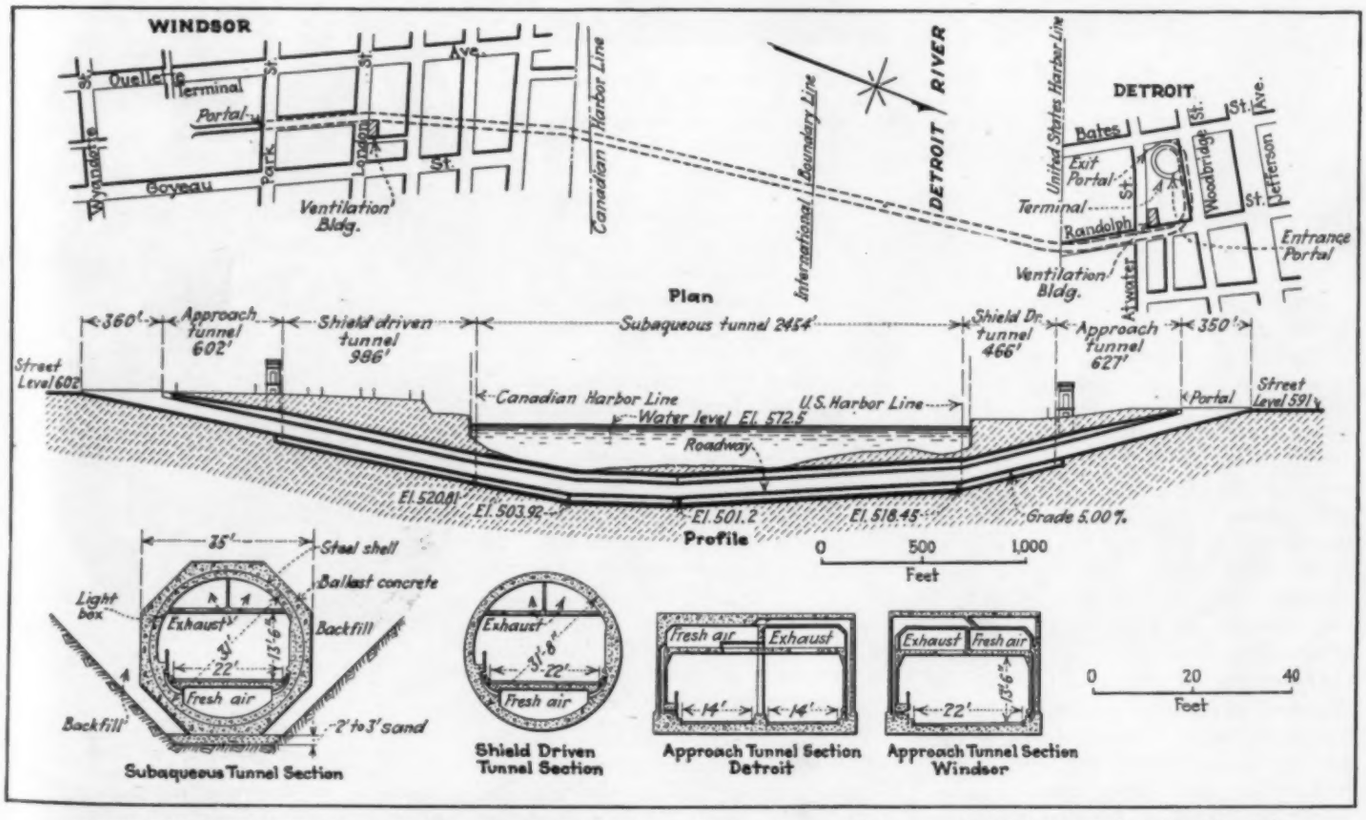


LAUNCHING tube segment. (*At right*) INTERIOR REINFORCING STEEL is rigidly supported by bars through holes in ring angles.

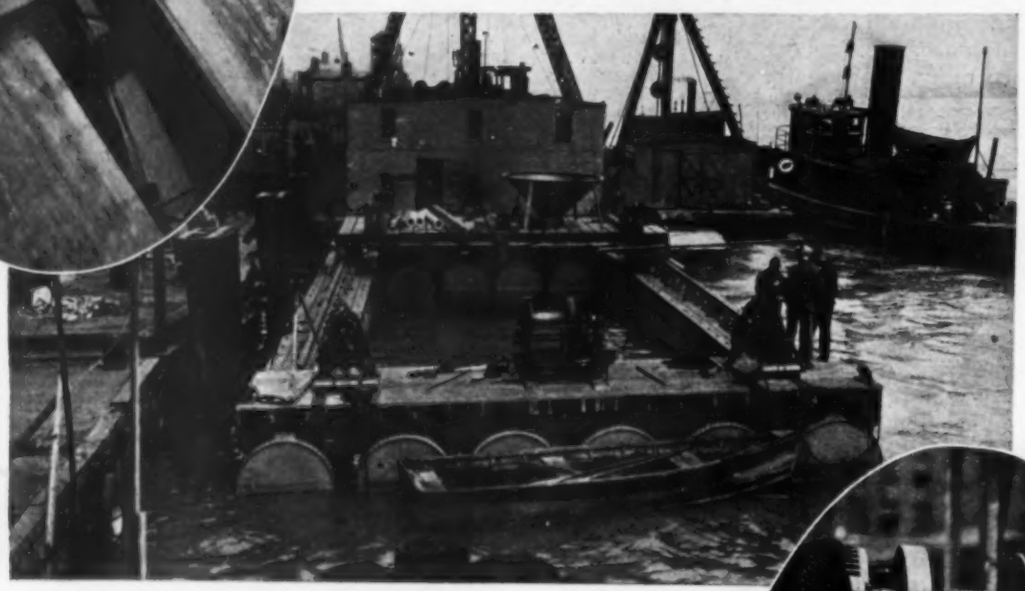
the scows. When tremie concrete has been placed to the point of almost sinking the segment, ten 5-ton concrete blocks are used to submerge first one end and then the other, allowing the lowering scows, 30x50x4 ft., drawing 14 in., to be floated over the tube. Divers shackle the hoisting falls to straps on the fifth diaphragm from each end of the tube.

After the load lines from the scows have been attached to the segment, concreting is continued until a load of 40 or 50 tons, including the concrete blocks, is on the lines. Tugs then tow the segment to the trench and sink it below the current before pulling it toward shore. When the segment is in approximate position, 27-ton concrete anchorages are placed 230 ft. upstream and 85 ft. downstream from each scow. A $1\frac{3}{8}$-in. mooring pennant from each anchorage is connected to a set of blocks and falls giving 40 ft. of adjustment on the scow. Similar moorings at both ends provide for longitudinal adjustments. The tube is maneuvered to exact position, and is lowered in such a way as to land evenly on the sand bed of the trench, in order not to gouge the subgrade. Instrumentmen on shore check the position and grade of the segment by masts on the segment erected so that they are vertical when the tube lies on its final grade line.

When the segment is in position on the bottom, the trench is filled with sand on both sides to prevent up-and-downstream movement of the tube; the balance of the concrete is placed by tremie, and the concrete blocks are removed. Divers inspect all underwater work. A dead weight of approximately 350 tons holds the segment down after removal of the blocks.



PRINCIPAL DETAILS of tunnel. As material of river bottom is firm clay, no piers are needed to support the subaqueous tube. Conditions at Detroit made jacketed steel tube most economical of three designs considered for this section.



SAND DRAG to level bed of trench consists of I-beam grillage suspended from movable carriage on pontoon raft. (*In oval, above*) OUTSIDE FORMS are attached to tube by means of bolts hooked to clip angles on the shell.

upon the anchor cables by the hoists to draw the raft below its normal water line, thus preventing any vertical motion due to wave action. The ends of the rails upon which the traveling carriage runs are set to grade by instrument from the shore, and the grillage is lowered to the elevation of the top of the sand fill. The carriage is drawn back and forth over the rails by a small 2-drum gasoline hoist mounted on it.

The sand bed at the bottom of the trench is from 2 to 4 ft. thick. Sand is deposited in the trench by clam-shell bucket.

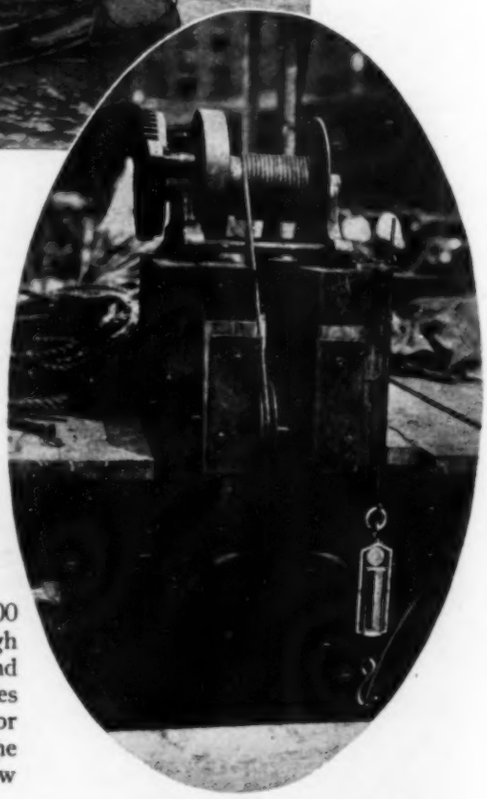
To determine accurately the position of the grillage with respect to the true grade of the top of the sand bed, measuring wires from the four corners of the grillage are attached to spring scales suspended by turn screws from the corners of the carriage. By adjusting the wires to the length desired, the scales read 100 lb. when the grillage is hanging free. When dragging is in progress, observations are taken on the scales. Readings of less than 100 lb. indicate that the sand bed is high and the grillage is moved back and forth over the sand until all the scales give continuous readings of 100 lb. for the length of the run. The bed of the trench usually is left 3 in. high to allow for compression under the tube.

Joints between tube segments are sealed from the outside with tremie concrete.

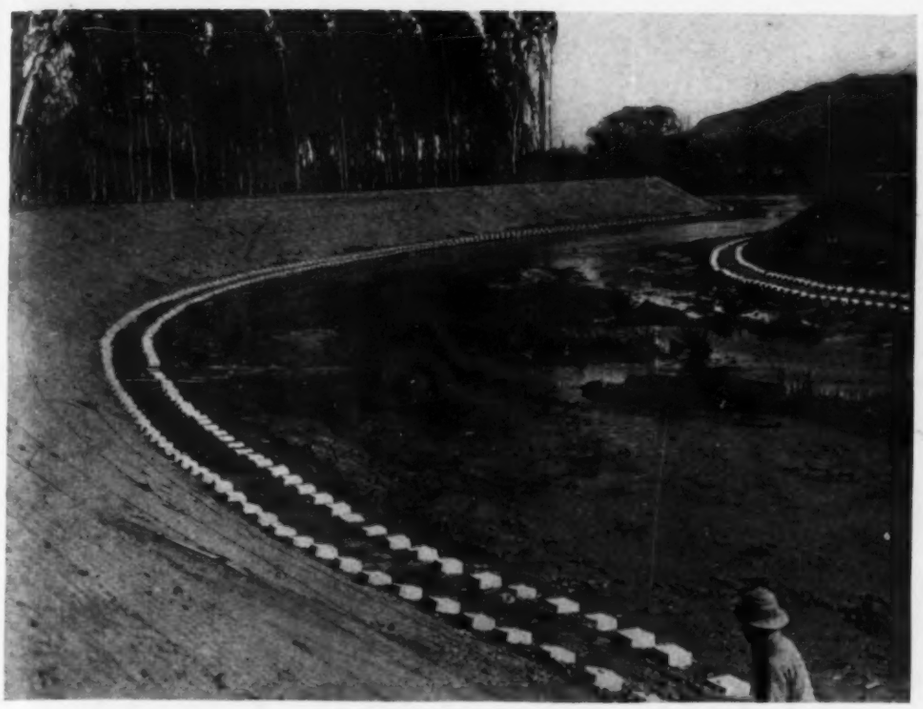
Leveling Sand Bed—A bucket dredge excavated the trench, getting lines from ranges on shore and grade by sounding. To level the sand fill in the bottom of the trench to grade, the contractor designed an underwater drag suspended and operated from a pontoon raft about 30x70 ft. in outside dimensions. An I-beam grillage is suspended from a traveling carriage on cables which pass through a rectangular opening in the raft. The carriage moves on rails parallel to the grade of the tunnel.

Operation of Drag—The raft is anchored at its four corners by 12-ton concrete blocks. Two 2-drum, 4 hp. gasoline hoists, one at each end of the raft, raise and lower these blocks. When anchored in position over the trench, sufficient tension is exerted

Tunnel Builders—The engineers for the Detroit-Canada tunnel are Parsons, Klapp, Brinckerhoff & Douglas of New York. B. R. Value is executive engineer of the project, and S. A. Thoresen is engineer of designs. The general contractors for the river section and shield-driven tunnel sections are Porter Brothers & Robert Porter, Spokane, Wash. Whitney Brothers Co., of Duluth and Detroit, have the sub-contract for the towing, concreting and sinking of the tube segments in the river section, and the Canadian Bridge Co., Ltd., Walkerville, Ont., is sub-contractor for the manufacture, erection and launching of the steel tube sections. Dredging, preparing the sand bed, and backfilling are being handled by the M. Sullivan Dredging Co., of Detroit, which is performing these operations under sub-contract.



HAND WINCHES on the carriage operate the four cables by which I-beam grillage is suspended. Measuring wires to determine position of grillage are attached to spring scales at four corners of carriage.



TOE OF LEVEE is protected by a mat composed of rows of gunite blocks. Only two rows are shown in this picture. Specifications require that blocks be placed 4 in. apart in both directions.

Levee Mats GUNITED AT LOW COST

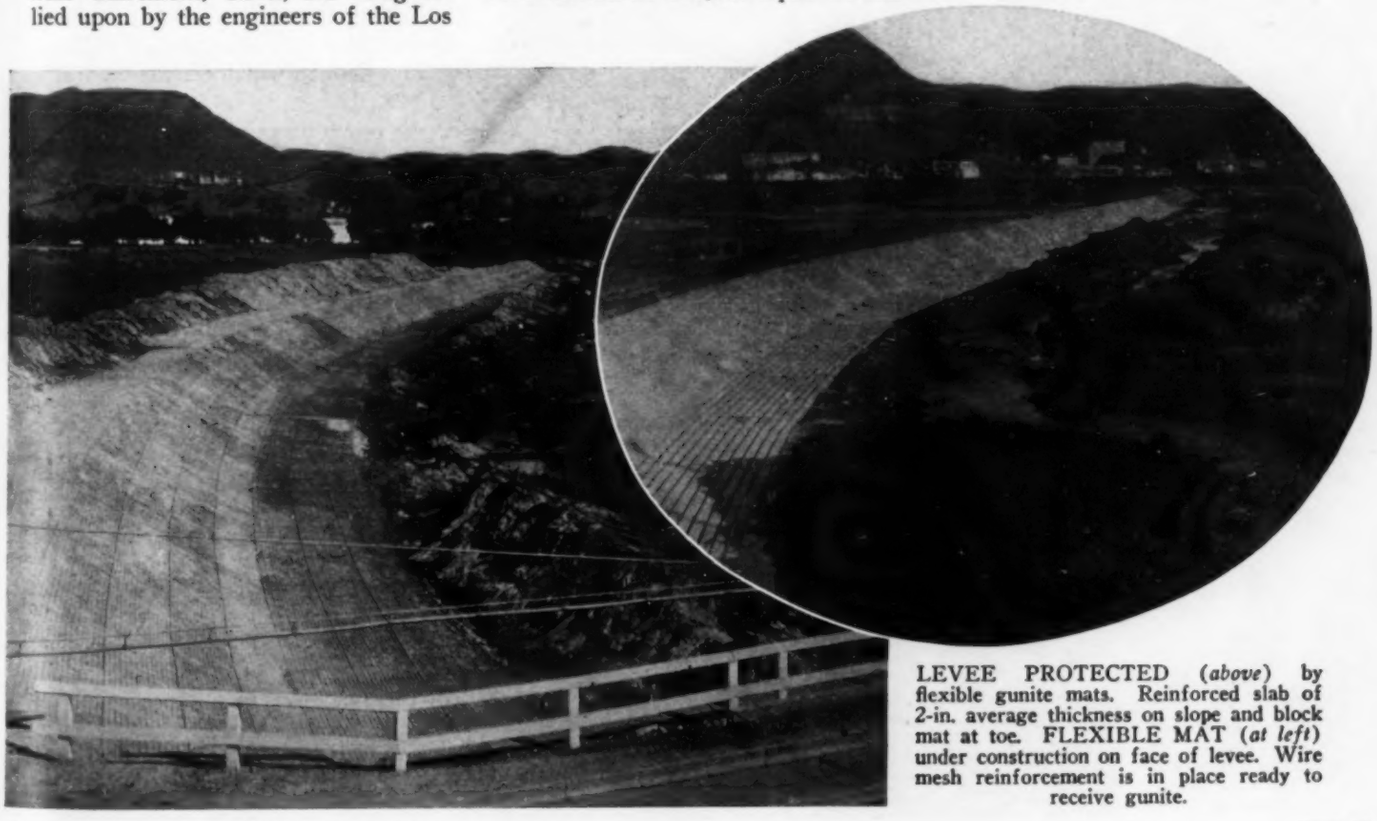
GUNITED concrete mats on the slope and toe of the levee along the west bank of the Los Angeles River at San Antonio Wash, near Claremont, Calif., are being relied upon by the engineers of the Los Angeles County Flood Control District to protect the levee against the erosive effects of winter and spring floods. In the public bidding for the construction of 210,000 sq.ft. of concrete mat on the levee slope and 90,000 sq.ft. at the toe, the Los Angeles Cement-Gun Co. entered the lowest bid. Unit prices were 5.3c. for the first item and 8.7c. for the second, making a total contract price of $18,960.

The thickness of the mat on the face of the levee tapers from 2½ in. at the bottom to 1½ in. at the top, where it ties into an integral cutoff wall, 8x8 in. in cross-section. Two layers of American Steel and Wire triangular mesh reinforcement are placed in this mat, which lies on a slope of 1½ to 1.

The mat extending out from the toe of the levee consists of rows of gunite blocks approximately 12 in. square and 3½ in. thick, placed in lines parallel to the line of the levee, with a spacing between them of 4 in. Concrete for slope mat and blocks was mixed in the proportions of 1 : 4½. The Los Angeles County Flood Control District supplied the cement, shaped the surfaces to proper lines and grades, and placed the mesh reinforcement which was pulled into place with hooks during guniting.

Immediately before guniting, the face of the fill was sprinkled with a fine spray of water. The completed slab was cured with burlap kept moist for 3 days. After removal of the burlap, the slab was sprinkled for 7 additional days.

Design and construction of the mats were under the supervision of E. C. Eaton, chief engineer, Los Angeles County Flood Control District.



LEVEE PROTECTED (*above*) by flexible gunite mats. Reinforced slab of 2-in. average thickness on slope and block mat at toe. FLEXIBLE MAT (*at left*) under construction on face of levee. Wire mesh reinforcement is in place ready to receive gunite.

MOVING CONCRETE HOPPER to new location on viaduct. (*At right*) VIADUCT and inclined approach.

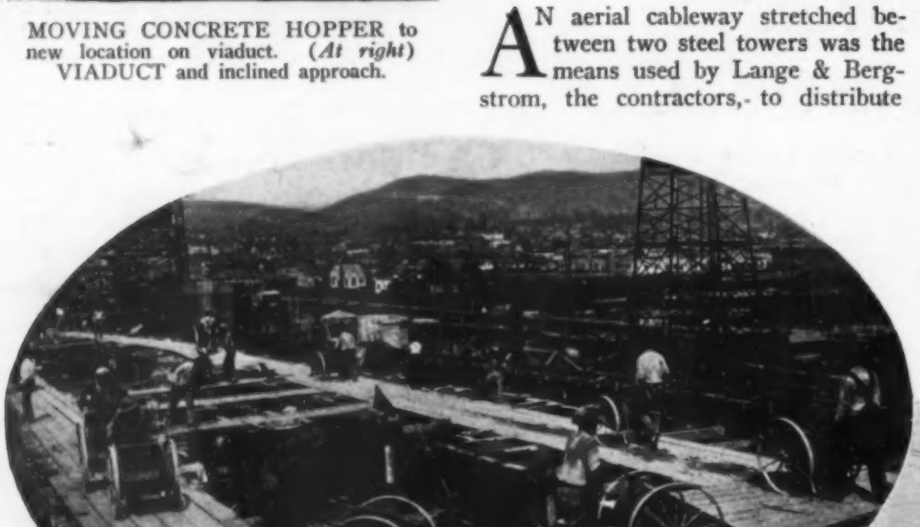
HIGHLINE CABLEWAY

Concretes 3,000-Ft. Viaduct

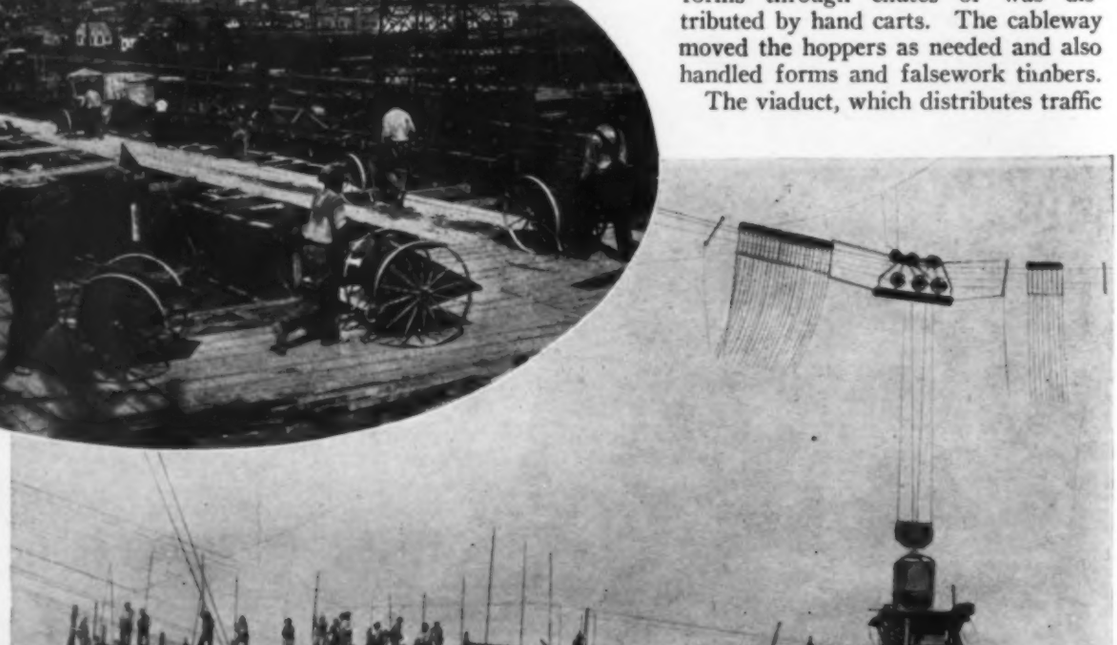
AN aerial cableway stretched between two steel towers was the means used by Lange & Bergstrom, the contractors, to distribute concrete over the Glendale-Hyperion viaduct, 3,141 ft. long, in Los Angeles. The structure comprises a number of 135-ft. concrete arch spans.

Concrete was delivered by the cableway to hoppers placed on the falsework or on the forms. From the hoppers, concrete either was discharged into the forms through chutes or was distributed by hand carts. The cableway moved the hoppers as needed and also handled forms and falsework timbers.

The viaduct, which distributes traffic



HAND CARTS (*above*) distribute concrete over runways from portable hopper.



OVERHEAD CABLEWAY delivers concrete to portable hopper on falsework by means of bottom dump buckets.

ARCH RIBS of the Glendale-Hyperion viaduct, as they look from below.

from two main arteries to numerous secondary routes, was designed by Merrill Butler, bridge engineer, under the direction of John C. Shaw, city engineer. R. H. Rook, inspector of public works, was in general charge of construction. Operations were supervised by H. P. Cortelyou, engineer of construction.

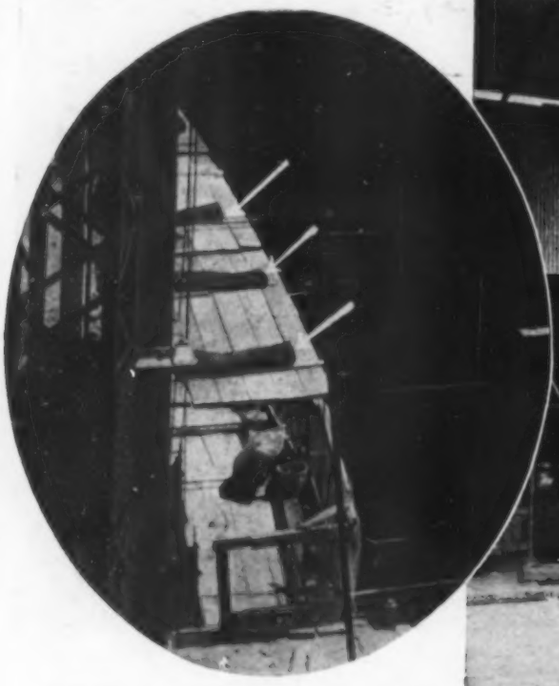
AERIAL CABLEWAY handles construction operations on viaduct over ½ mile long. Note steel towers. (*In oval, above*) SPRAY PUMP is used to cover form lumber with oil.

Safety Principles as Applied

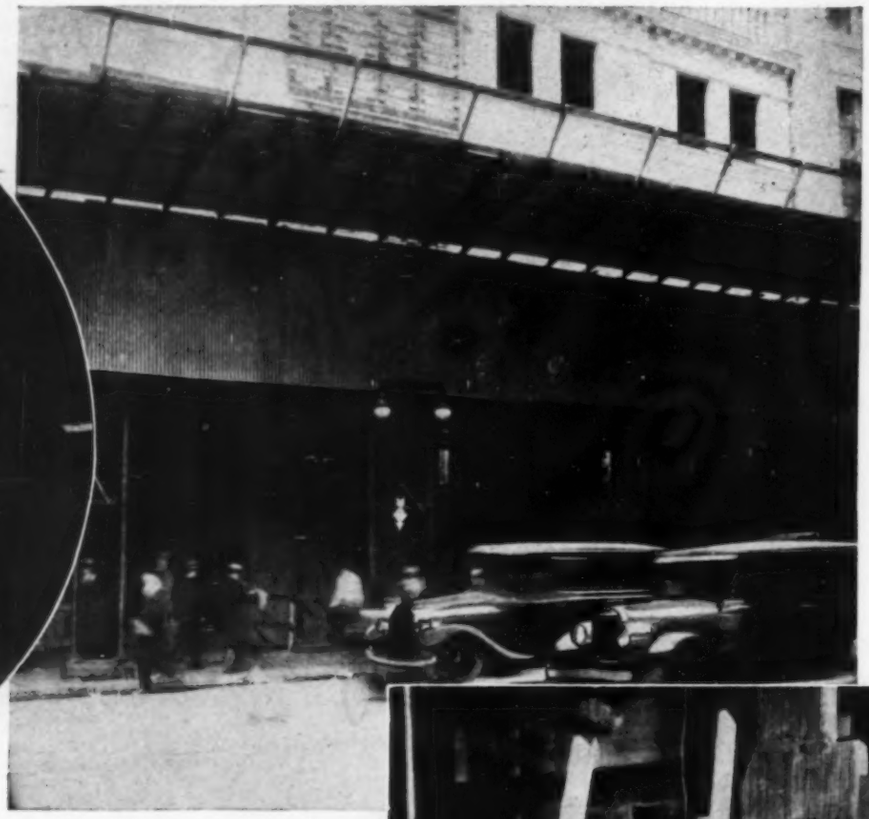
What Contractors to Reduce

Herewith are additional examples of how contractors are applying accident prevention measures on their work, supplementing safety pictures that have appeared in the July, August, and September issues of *Construction Methods*.

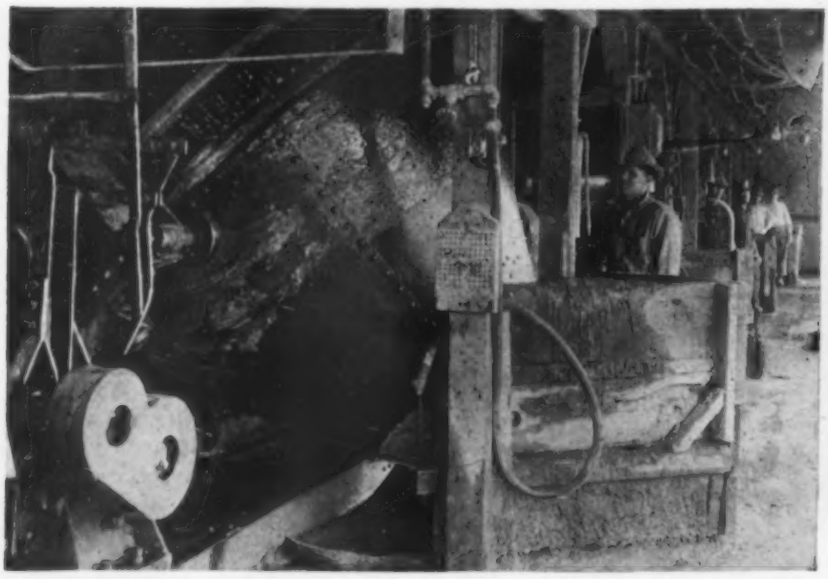
More safety pictures are wanted for forthcoming issues. How about a couple from YOUR job?



1 ROOFED SCAFFOLD protects workers on Lincoln Building, New York. Note rolled tarpaulins ready in case of rain. Dwight P. Robinson & Co., contractors.



2 CATCH-ALL, extending 8 ft. over street intercepts objects falling on bridge and bouncing toward street.

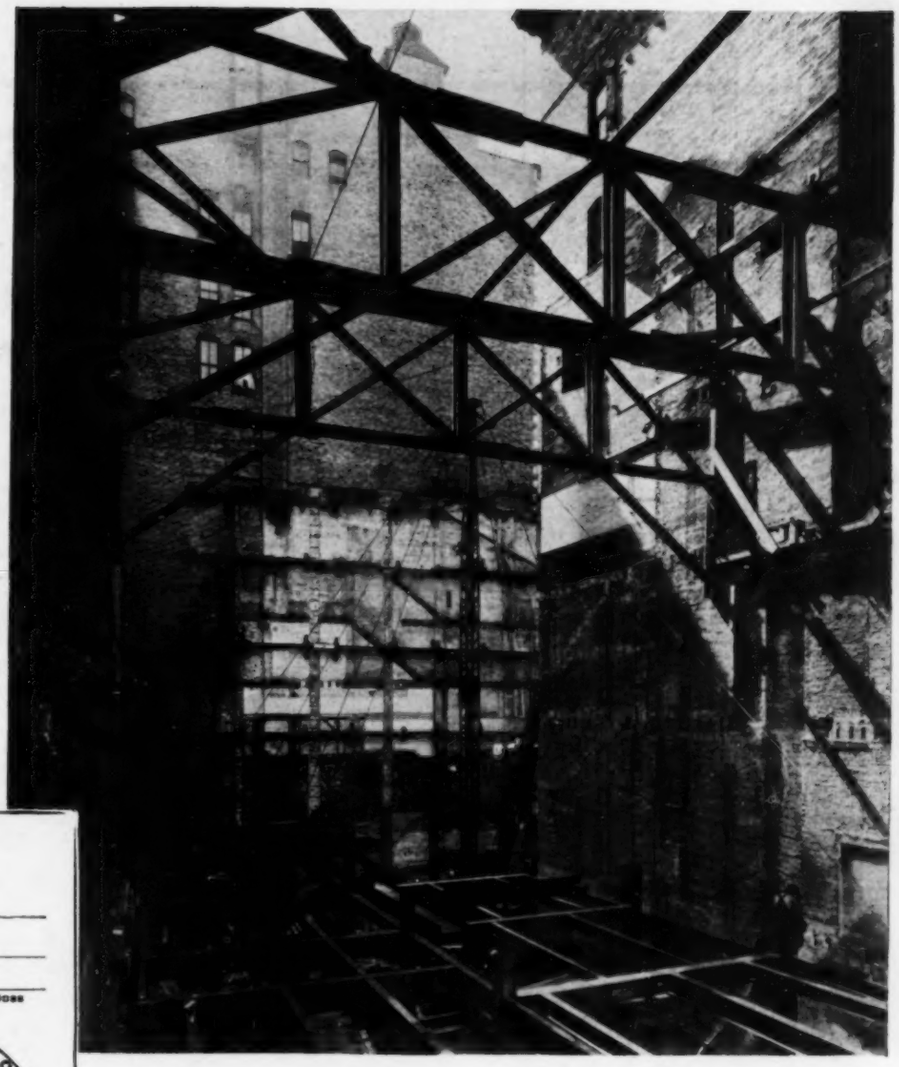


3 WOODEN GUARDS shield dumping ends of four 2-yd. tilting mixers supplying concrete for the Pardee dam in California. Atkinson Construction Co., contractor.

4 SPECIAL LADDERS for exclusive use of bricklayers working on horse scaffolds remove need for climbing or jumping. Dwight P. Robinson & Co., contractors for Lincoln Building, New York.

on the Job

Are Doing Accident Toll



5 SHORING AND BRACING (*right*) of old walls of adjacent structures is safety measure adopted by the Morton C. Tuttle Co., contractor, of Boston, Mass., on new building for the F. W. Woolworth Co. In the photograph the lower spur shoring has been replaced by structural steel, but the overhead truss bracing is still in place to protect the old walls from collapse. On rear wall note that several lines of horizontal strapping have been installed.

Form SC 6a 2M5 L.A.

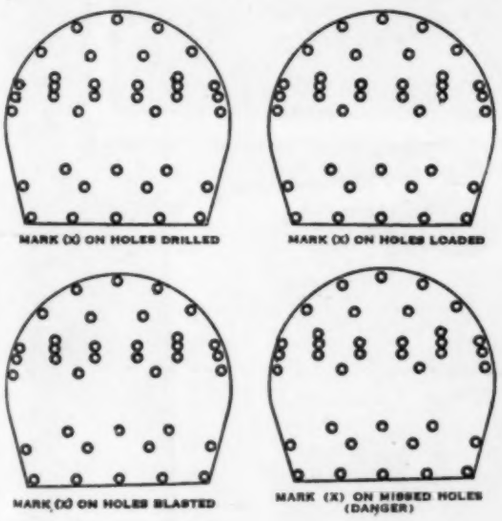
SOUTHERN CALIFORNIA EDISON COMPANY

TUNNEL SHIFT REPORT

CAMP NO._____ HEADING NO._____

DAY_____
NIGHT_____ } SHIFT DATE_____
GRAVEYARD_____

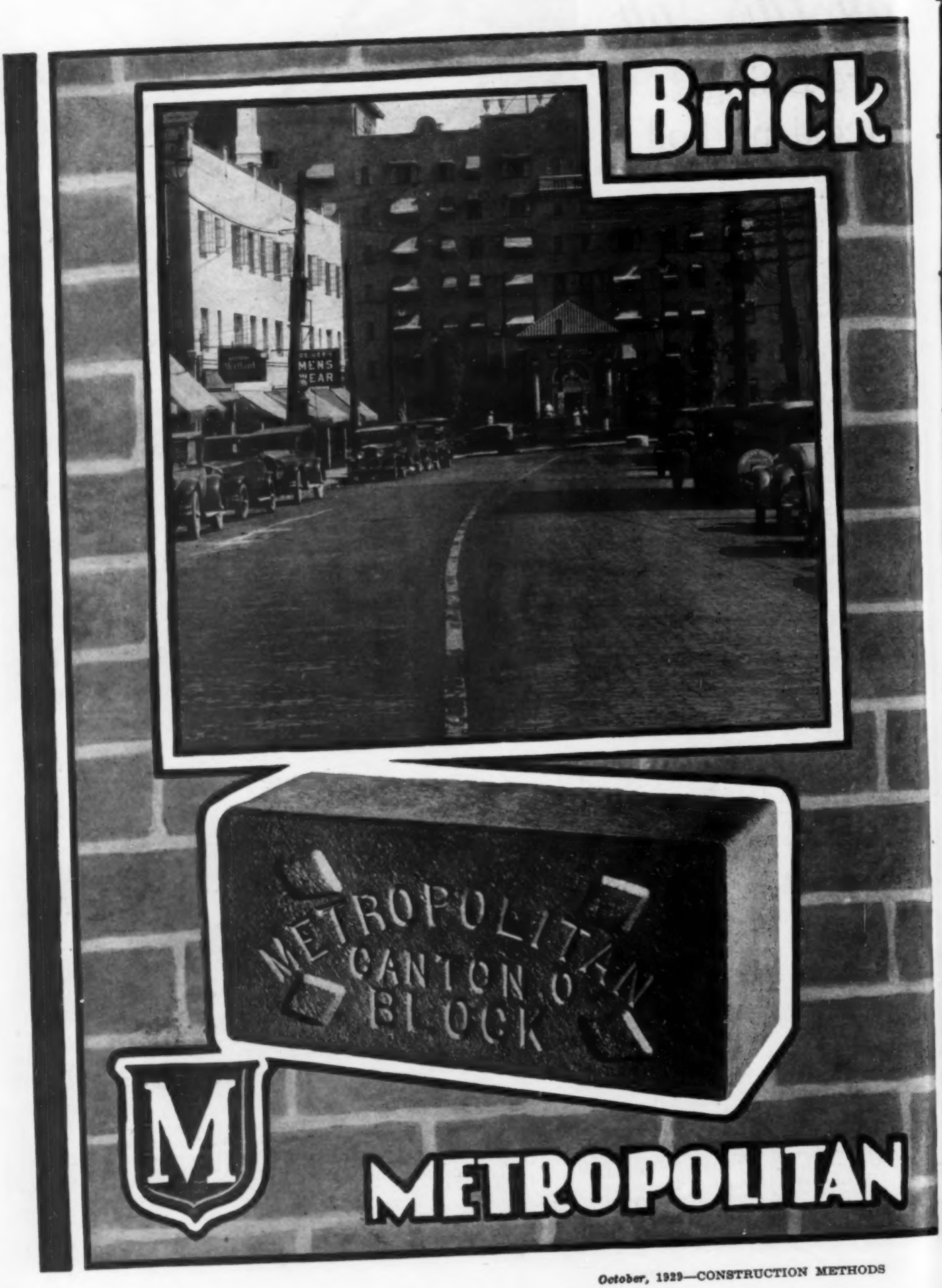
SIGNED_____
SHIFT BOSS



REMARKS:

6 TO CHECK UP on tunnel drilling and blasting operations the Southern California Edison Co. requires this form to be filled out by its shift bosses. For every round the four diagrams must be marked with an "x" for each hole (1) drilled, (2) loaded, (3) blasted and (4) missed. This procedure protects the tunnel workers from injury due to accidental firing of a "missed" hole.

7 WOOD HOUSING protects both the operator and the mechanism of this steam shovel from damage by blasting in cramped quarters where equipment cannot always be backed away to a safe distance. The protective wood sheathing was installed as a safety measure by the Southern California Edison Co.


Brick
MENS WEAR
METROPOLITAN
CANTON
BLOCK
METROPOLITAN

on the city street

indicates farsightedness and economical management

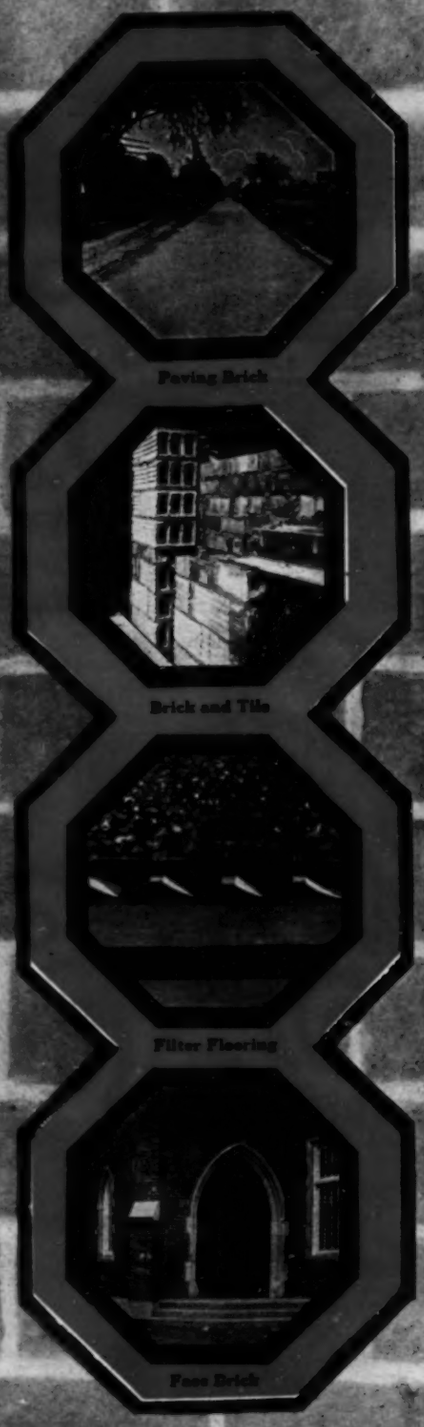
One of America's centers of Industry has kept actual and accurate figures on paving cost from the time pavement was laid until replaced—Brick has not only proved most economical but given safe, trouble-free road surface over long periods.

Heavy trucking—light draying—fast road traffic—all traveled these streets day after day, year after year, and brick outlived all other surfaces.

Resistance to seasonal changes, strength to withstand road shock, and endurance are features of brick, appreciated both by the rider and the city official.

Metropolitan, Bessemer and Olean paving blocks will be found in many of the prominent cities east of the Mississippi. Specify any of these brands for better roads and real economy.

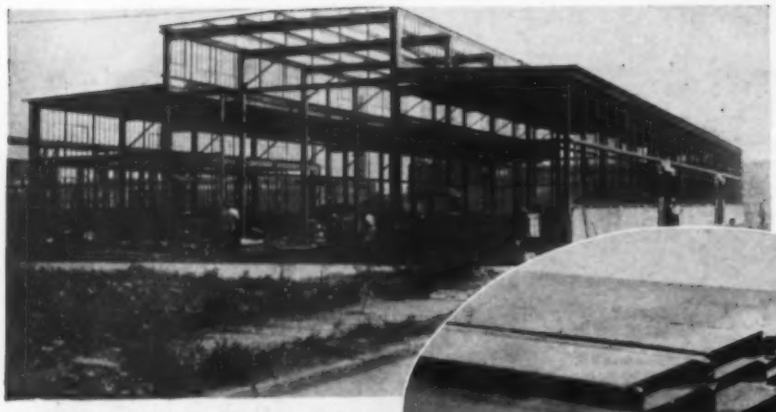
METROPOLITAN PAVING BRICK COMPANY
CANTON ~ OHIO



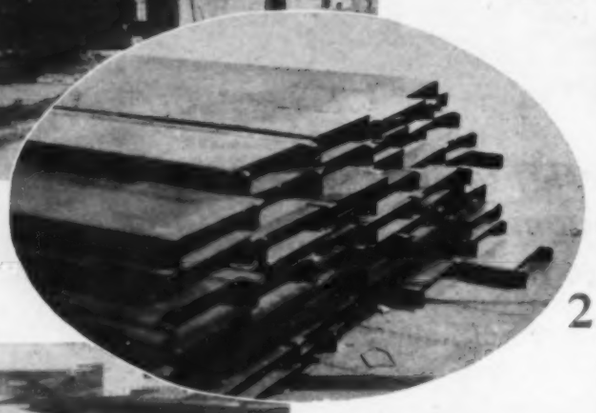
BESSEMER AND OLEAN

Step-by-Step Interlocked Form Warehouse

HOW a new type of interlocking sheet steel roof deck with a built-up insulated covering was installed on a 72x210-ft. warehouse at Harrison, N. J., is illustrated herewith. The design provides for a total roof load of 45 lb. per square foot. The steel deck, weighing



1 WAREHOUSE at Harrison, N. J., where steel roof deck was installed, is 72x210 ft. in plan, divided into three bays, with monitor running full length of center bay.



2 ROOF DECK UNITS (*left*), rolled from No. 20 gage metal, are 6 in. wide, 1¼ in. deep and 20 ft. long. They weigh 1¼ lb. per linear foot and have flanges that interlock.

3 PURLINS are 9-in. channels, spanning 20 ft. They are spaced 6 ft. 4 in. in center bay and 6 ft. 8 in. in side bays.

6 EAVE CLOSING PLATE is next attached to purlins, after which the steel deck sheets are laid and clipped to the purlins.

4 PREPARATIONS for attachment of gable closing plates. Punching method shown in photo has since been superseded by improved clamp device into which back part of closing plate is inserted after deck sections are in place.

7 CLIP is slipped on to end of interlocking deck sheet section to anchor it to purlin

5 CLOSING SHEET is laid on top of gable closing plate and attached to purlins by means of clips.

Field Methods

Steel Sheets Roof Decking

2½ lb. per square foot., is formed of the Truscon Steel Company's Ferrobord units rolled from 20-gage Armco ingot iron into sheets 6 in. wide, 20 ft. long and 1¼ in. deep, weighing 1¼ lb. per linear foot. Purlins are 9-in. steel channels spaced 6 ft. 4 in. and 6 ft. 8 in., respectively, for the center and side bays of the structure; the purlin spans are 20 ft. The steel deck units are attached to the purlins by special clips.

8 HAMMERS bend wings of clips around purlins to hold decking in place. Clips are placed on every rib or at 6-in. centers at every purlin.

9 DETAIL OF CLIP, showing how vertical flange at center of clip is hammered over deck sheet ready to receive next sheet.

10 BUTT JOINT is made with aid of clip driven into end of deck sheet. Abutting sheet, in turn, is driven over butt joint clip.

11 RIDGE DETAIL, with Herman Faske, foreman, demonstrating how clip anchors Ferrobord section to steel framework.

12 AFTER DECK SECTIONS have been placed and clipped to purlins a ridge plate is laid over the longitudinal joint.

13 CLOSURE of deck is completed by screwing down ridge plate.

(Concluded on next page)

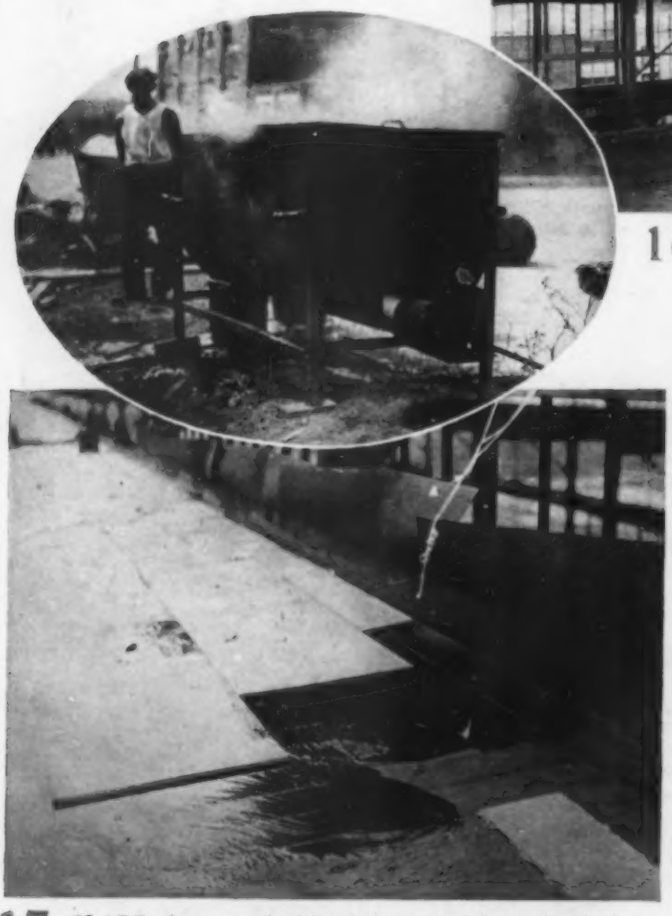
Step-by-Step Field Methods

(Continued)

14 NAILER CORNICE BEAD is driven under eave closing plate and over deck sheets, sealing eave or gable and furnishing nailing bead for the roofing.

15 METAL BACKING PLATE is bolted to monitor curb angle and screwed to roof deck. In same operation flashing is placed to receive the roof covering.

16 EASY TO HANDLE. Ferrobord steel deck units are 6 in. wide and 20 ft. long, weighing only 1¼ lb. per linear foot.



17 SLABS of any standard insulating material are placed after the steel deck has been swabbed with roofing asphalt delivered from heating kettle *(in oval above)*.

18 FROM TWO TO FIVE PLIES of asphalt-saturated felt are applied over the insulating material to complete the warehouse roof.

DOUBLE HAMMER UNIT

Drives Steel Caissons

PAIR OF AIR HAMMERS, united by steel yoke, drive 44-in. cylinder. Special driving head, reinforced with riveted bands, protects top of caisson. PIPE PILES *(right)* carry some lighter column loads. Couplings are the same type used on large caissons.

IN PUTTING down the caissons for the foundation of the world's tallest structure, the Bank of Manhattan Company Building at 40 Wall St., New York City, Spencer, White & Prentis, Inc., foundation contractors, used McKiernan-Terry pile hammers, operated by air, to drive some of the cylinders. In all, six cylinders of 44-in. and 52-in. diameter were driven by hammers.

Three of the six hammer-driven large diameter cylinders were put down by the use of one McKiernan-Terry 9-B-2 hammer, acting at the center of a girder placed across the top of the cylinder. The other three cylinders were driven by a combination of two No. 6 hammers, weighing 2,900 lb. each. A steel yoke, bolted to the top of the hammers, held them in position.

The cylinders were made of $\frac{1}{2}$ to $\frac{5}{8}$-in. steel plate in sections 4 to 8 ft. long, with one electrically welded longitudinal joint. Couplings consisted of internal sleeves 14 in. long with $\frac{3}{4}$-in. bands electrically welded to the outside. A special driving head, made up of a short pipe section with reinforcing bands riveted to top and bottom, was used on the cylinders.

With two hammers being used on a large diameter pipe, progress was noticeably better when the hammer blows synchronized. Once started, the hammers would continue to deliver blows in the same relationship, either independently or in unison. If they happened to start out of step, they could be synchronized by closing and opening the valve once or twice.

Solid rock is at depths varying from 51 to 96 ft. below street level, the average depth being about 80 ft. The overlying materials consist of a water-bearing sand to an average depth of 44 ft. below the street, underlaid by hardpan containing a high percentage of boulders. Cylinders were driven to the hardpan stratum and were excavated. After the cylinders had been seated in the hardpan with the hammers, excavation was continued to rock.

To save time in starting erection of the new structure, the foundations were put down in the basements of the old buildings while they were being wrecked. Most of the cylinders were jacked down under the footings of the old buildings. A few lighter column loads are carried on 16-in. steel pipe piles, driven to rock and blown out by a combination air and water jet.

For Spencer, White & Prentis, Inc., Anton Gunther, superintendent, and W. T. McIntosh, engineer, are resident supervisors of construction. The foundation work was performed under contract with Starrett Brothers, the builders.

CAISSON, 52 in. in diameter, driven to hardpan by one air hammer acting at center of girder placed across top of cylinder. Excavation is being continued to rock.

Bridge Contractor Uses FLOATING

C. A. WHITE, engineer, Merritt-Chapman & Scott Corporation.

NOVEL methods are being used by the Merritt-Chapman & Scott Corporation, New York City, contractor for the Washington Bridge, Providence, R. I., to construct river piers on pile foundations and to jack the steel falsework trusses which support the concrete arch ribs of certain spans. A mechanical underwater pile cutter and the application of sand jacks to the lowering of the arch falsework trusses are two of the most important features of the work.

BUILDING COFFERDAM FRAME for pier 6, 43 ft. deep, with a footing 33x101 ft. in plan. Sheeting of all river piers is driven on the neat line of the footing. The wales of this frame are built up of four 12x12-in. timbers.

UNDERWATER PILE CUTTER consists of a movable girder and shaft mounted in the leads of a piledriver. During periods of inactivity, girder, shaft and pulley are raised. The rotary saw is connected to the lower end of the shaft.

Description of Bridge—The bridge is a highway structure being built across the Seekonk River between Providence and East Providence to replace an older bridge alongside. It comprises a double-leaf bascule span 150 ft. long and twelve concrete arch spans of two lengths, 105 ft. and 89 ft.

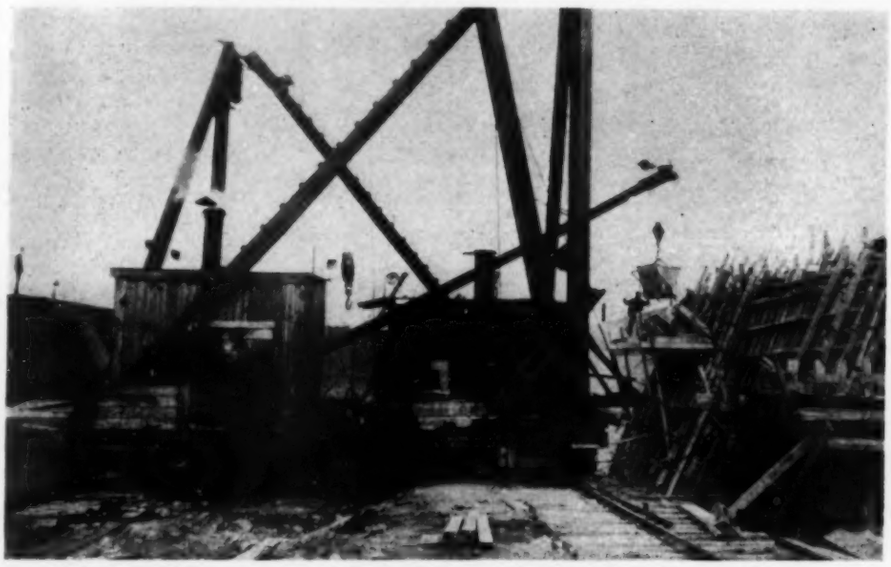
Of the fourteen piers which carry the twelve arches and the bascule leaves, all but the west abutment rest on timber piles. These piers are designated 1 to 14, from west to east. The number of piles under the piers varies from 288 under pier 2 to 1,212 under each of the bascule piers, 7 and 8. In length, the piles range from 35 ft. to 50 ft., depending on the load and the character of the material, which is mostly coarse sand and gravel, with occasional pockets of fine sand, clay, mud, and shell. Six of the piers, 5 to 10 inclusive, are in the river. The deepest footing is at pier 6, 43 ft. below mean tide, while the footings of the bascule piers are about 40 ft. under water.

Pier Construction—The first river piers to be completed were 8, 9 and 10. Two methods of construction were used on these piers, each method adapted to the particular conditions encountered. The footings of 9 and 10, being at moderate depths of 20 ft. and 15 ft., respectively, permitted the contractor to follow standard practice economically by constructing the cofferdam, driving wood piles inside it, and sealing and unwatering the cofferdam before cutting off the piles. The footing of pier 9 is 28x99 ft. in plan; that under pier 10 is 25 ft. 6 in.x98 ft.

Construction of Bascule Pier—Altogether different procedure was followed at pier 8, where 1,212 45-ft. piles had to be cut off below the top of the 14-ft. seal. This footing is 55x123 ft. in plan. A dredge excavated to 4 ft. below grade, and a floating piledriver equipped with telescopic leads drove the wood piles. To cut off the piles, the contractor used an underwater cutter consisting of a rotary saw mounted at the bottom of a vertical shaft which could be adjusted in the leads of a floating piledriver to operate at the proper depth. After cutting off

MACHINE
to Cut Underwater Piles

G. C. DENNY, superintendent, Merritt-Chapman & Scott Corporation.



BOOM OF TWO-DERRICK TRAVELER, between retaining walls of Providence approach, lifts bucket off small flat car and places concrete in wall form.

the piles, the contractor erected two derricks on piles at the site, floated the cofferdam frame to position, drove 55-ft. steel sheeting, tremied the 14-ft. seal, and pumped out the cofferdam.

Underwater Pile Cutter—The adjusting apparatus of the underwater cutter is mounted in the steel leads of a floating piledriver. A steam engine on the deck of the steel hull is connected by belt drive to a pulley keyed on the vertical shaft. A long slot, or keyway, in the shaft makes it possible to raise and lower the shaft while keeping the pulley in constant position. The castings which contain the bearing boxes of the shaft fit the guides of the piledriver leads and inclose a long steel girder hung in the leads. They can be moved in relation to either shaft or girder.

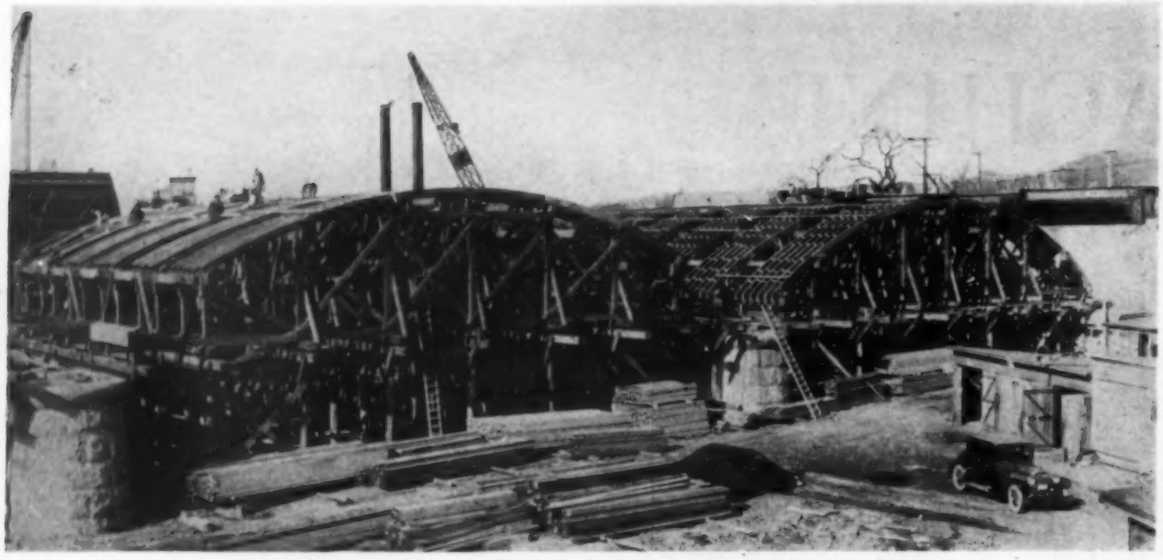
This adjustable relationship of shaft, bearing boxes, and girder allows several means of regulating the depth of the saw. For the bridge pier work, however, the relation of the shaft to the girder was fixed, and all adjustments were made by raising or lowering the girder. Gage marks on the back of the girder indicated the distance to the saw. To regulate the position of the girder so that the saw cut at the proper depth, despite tide variation, the crew either checked a target on the girder by means of a surveyor's level set on some solid foundation or adjusted the girder in accordance with tide readings taken from a gage installed nearby.

Spotting Piles—The utility of the cutter depends upon the certainty with which the saw can be directed against the pile. A definite system of spotting and finding piles was developed. Two targets fixed the alignment for the piledriver, while a wire stretched from a pile bent marked the distance to each pile in a line by a numbered brass check attached to the wire. The cutter worked from the same set of targets along the wire. When operating steadily, the machine could cut 400 to 500 piles a day.

Cofferdam Construction—As the driving in the sand and gravel of the river bottom was not particularly hard, the contractor used Larssen deep-section steel sheet piling, weighing 25 lb. per square foot of wall, to good advantage. This piling makes a practically watertight joint. Three or four Pulsometer pumps unwatered the smaller cofferdams. On pier 8, four 6-in. Pulsometers and two 10-in. centrifugals were sufficient to pump out the dam.

Bracing frames were built entirely of 12x12-in. timbers, except for the cofferdam of pier 8, in which the wales

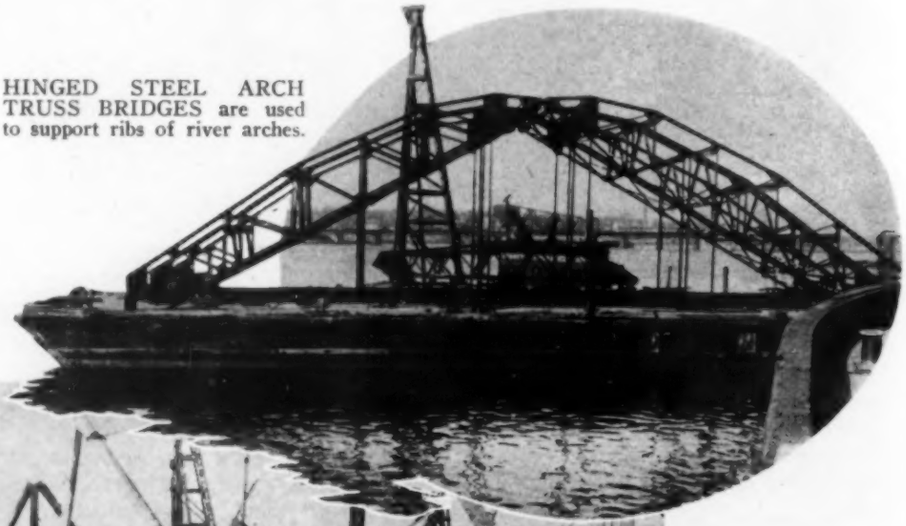
SWINGING LEADS, hung from derrick booms, drive batter piles at pier 4. Similar equipment is used to drive piles at all piers except 6, 7 and 8, on which floating piledriver does the driving.



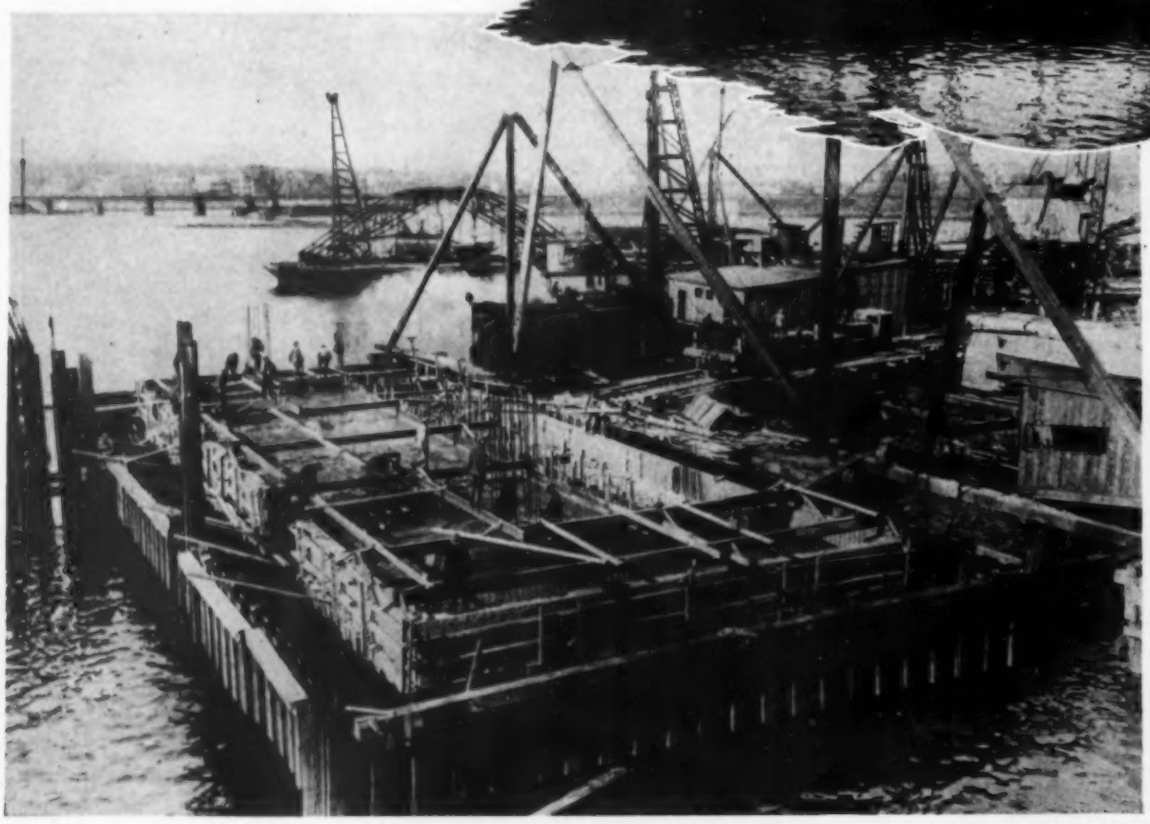
TIMBER FALSEWORK carries the arch ribs of all shore spans.

consisted of three courses of 24-in. steel H-beams.

Driving Short Piles in Deep Water —On pier 6, the deepest pier, the contractor drove 37-ft. wood piles in 43 ft. of water without using a follower. To do this work, the pile-driving crew lowered the telescopic extension of the leads part way into the water, slipped the pile into the leads, pushed the head of the pile under the McKiernan-Terry 11-B-2 hammer, and dropped the hammer and leads to start the pile. A wire across the front



HINGED STEEL ARCH TRUSS BRIDGES are used to support ribs of river arches.

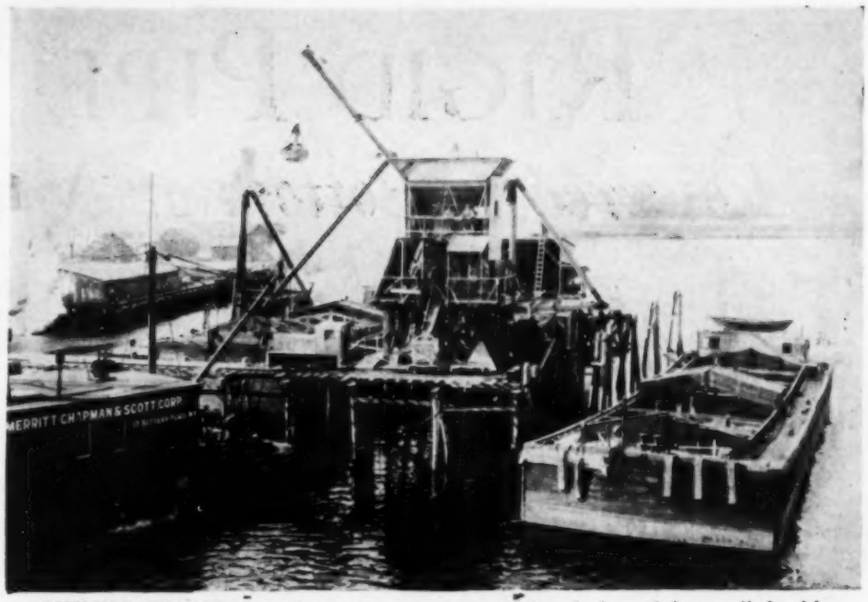


PLACING LAST BATCH in pier 8, containing 8,160 cu.yd. of concrete. Standard-gage gasoline locomotive pushes flat car carrying two bottom-dump buckets to pier, where two derricks place concrete. Four buckets are in use, two being filled at mixer, while other two are being dumped at pier.

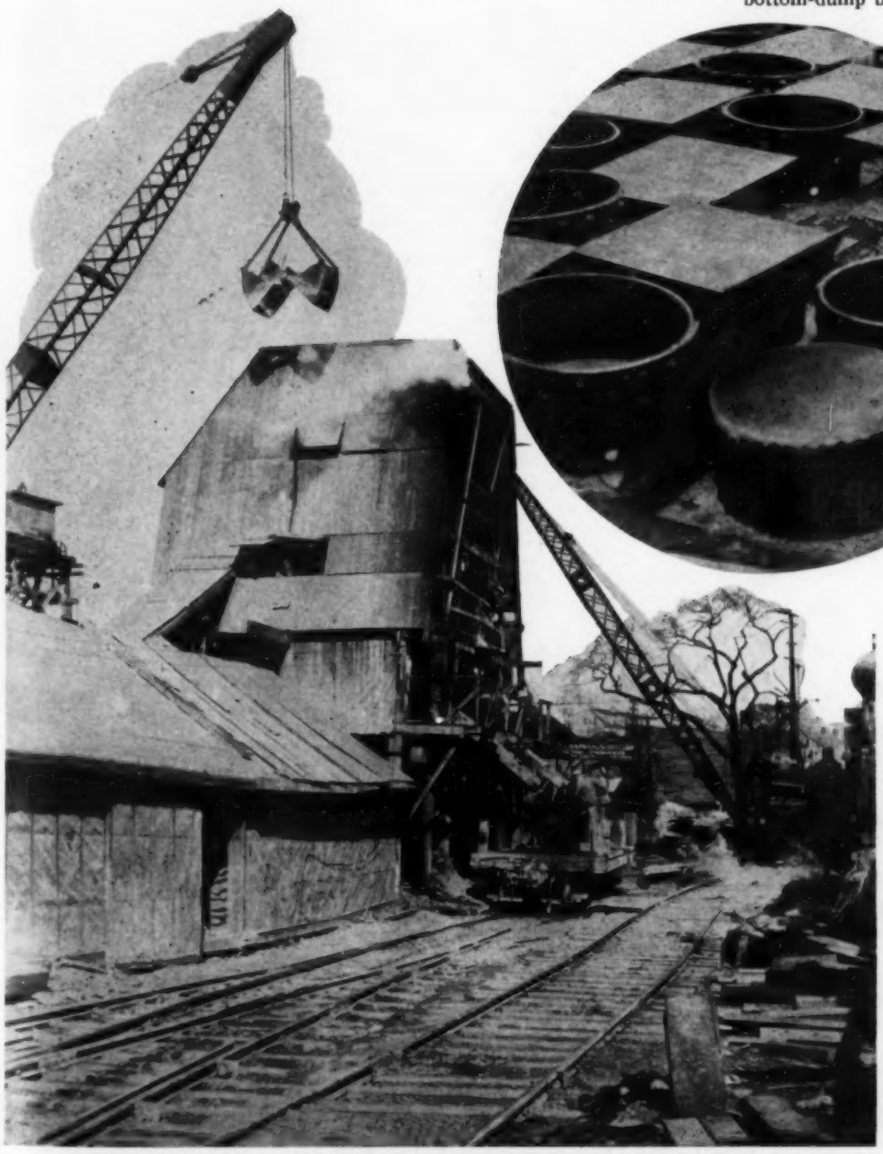
of the leads prevented the pile from floating out once it had been inserted.

Falsework Trusses—Timber falsework is used under all shore arches; but, for the four river arches, the contractors decided that two sets of steel centering would be more economical. A steel arch bridge resting on the piers supports each concrete rib during construction. As there are six ribs in each arch, twelve steel arch bridges are required for the two sets of falsework. Each bridge is made up of two hinged trusses connected by beams on which the formwork rests.

Sand Jacks—Each steel falsework bridge bears on four sand jacks, placed under the ends of the trusses. The sand jack consists of two parts: a bottom cylinder about 18 in. in diameter and a solid top cylinder which telescopes inside the lower like a piston. Both cylinders have steel walls. The upper one is filled with concrete. The bottom cylinder has two holes near the base plate. In operating the jack, the lower cylinder is filled with fine, dry sand to within a few inches of the top, and the piston is placed on the sand. To lower the weight supported on the jack, it is necessary only to remove the stopper from a hole. The fine sand flows out like water, and the lowering may be halted at any stage by replacing the stopper. These jacks give very delicate control of elevation. Oak wedges are used under the timber arch falsework.



MIXING PLANT erected over water at west side of channel is supplied with materials by derrick from barges tied alongside. The 1-yd. mixer discharges into bottom-dump buckets on small flat cars.



CONCRETE MIXING PLANT on East Providence side is steam operated. Locomotive crane feeds 100-ton bins above the mixers from stock piles under elevated belt conveyor. Second belt conveyor carries cement, in sacks, to platform above mixers. Two 1-yd. mixers discharge into buckets on flat car. (*In circle*) SAND JACKS consist of hollow and solid cylinders.

The Washington Bridge Commission, created for the purpose of building this structure, is composed of the five members of the State Board of Public Roads, with two additional members from Providence and two from East Providence. Abram L. Atwood, chairman of the Board of Public Roads, is chairman of the bridge commission. C. W. Hudson, New York City, is consulting engineer for the bridge commission. G. H. Atwood is resident engineer. For the Merritt, Chapman & Scott Corporation, G. C. Denny, superintendent, and C. A. White, engineer, are in charge of field operations.

All piers now have been completed above water level. The contractor expects to finish the bridge next year, well within the specified two-year period.

RIGID PIPE LINE

Lowered to Bottom of Navigable River

THE Spiniello Construction Company of Newark, N. J., used a unique method to complete the 510-ft. crossing of a navigable river with each of two 42-in. rigid pipe lines in the 30 hours allowed for the operations by the War Department. These pipes form the Passaic River crossing of the Kearny, N. J., water supply line, which taps the Belleville reservoir of the Wanaque aqueduct.

The two mains are inverted siphons supported on the caps of pile bents in a trench on the bottom of the river 25 ft. below mean low water. Because of the War Department order requiring that a channel 90 ft. wide be left clear in the middle of the stream until noon, Saturday, July 27, when the river might be closed to traffic until 6:00 p.m. Sunday, the contractor was compelled to devise a method which would allow the first water main to be completed and placed in 30 hours.

Design of Pipe—Thomas J. McCarthy, construction engineer for the work, describes the operation as follows: "The contract plans specified a double line of 42-in. x ½-in. lock-bar steel pipe with riveted girth seams, calked inside and out, the pipe to be furnished in 30-ft. lengths and encased in concrete 4 in. to 12 in. thick. This design made a very rigid structure without flexibility of any kind throughout its entire length of 510 ft.

"The usual procedure would have been to cofferdam the river in sections, completing the pipe within one section and advancing to the next coffer. This method of construction was objected to by the U. S. War Department, as it would have been necessary to divert navigation around these cofferdams—a very dangerous undertaking. Moreover, a cofferdam of this size would have contracted the waterway of the river, inducing currents that would have been hazardous to the navigation interests. From a contractor's viewpoint the cofferdam method would have been objectionable by reason of the large amount of necessary internal bracing. To lay 30-ft. lengths of pipe through the bracing, and to rivet, calk and test the pipe within a cofferdam approximately 35 ft. deep in a river, the bottom of which is a water bearing sand and gravel, would have been very difficult and costly.

PLACING CENTER SECTION of rigid 42-in. water main to close 90-ft. channel opening. Pipe is suspended from winches on towers.

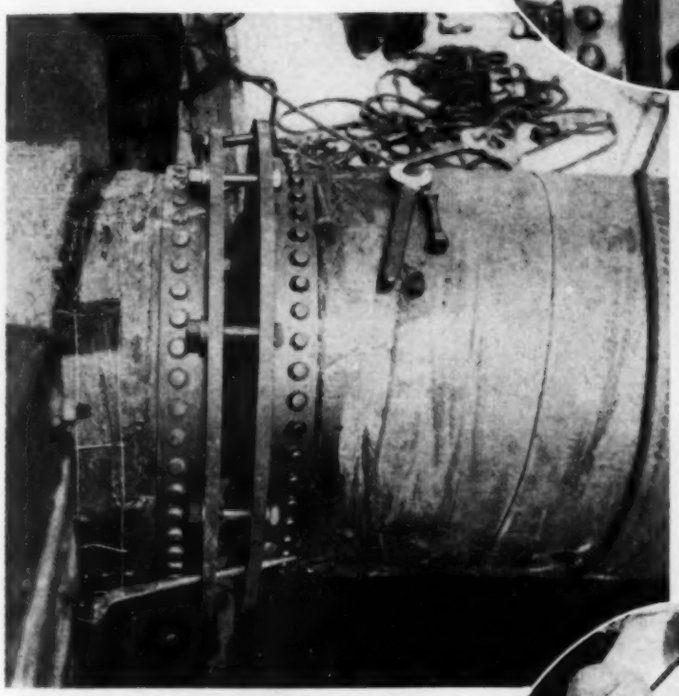
SHORE TOWER supports winch from which leg of rigid inverted siphon is suspended.

Construction Procedure—"The method of construction adopted by the contractor was to span the river with ten towers spaced about 50 ft. apart, leaving a gap of 90 ft. at the center of the river for navigation. Each tower consisted of ten to twelve 60-ft. piles capped with 12x12-in. timbers, the caps set about 14 ft. above low water, excepting the two shore towers where the caps were set 28 ft. above low water to conform to the shape of the pipe profile. On these towers the pipe was suspended, starting from each shore and extending to the 90-ft. opening in the middle of the river. The pipe was riveted, calked and encased in concrete while hanging on these towers, and at the time agreed upon by the Federal authorities the 90 ft. piece was connected by means of two flange

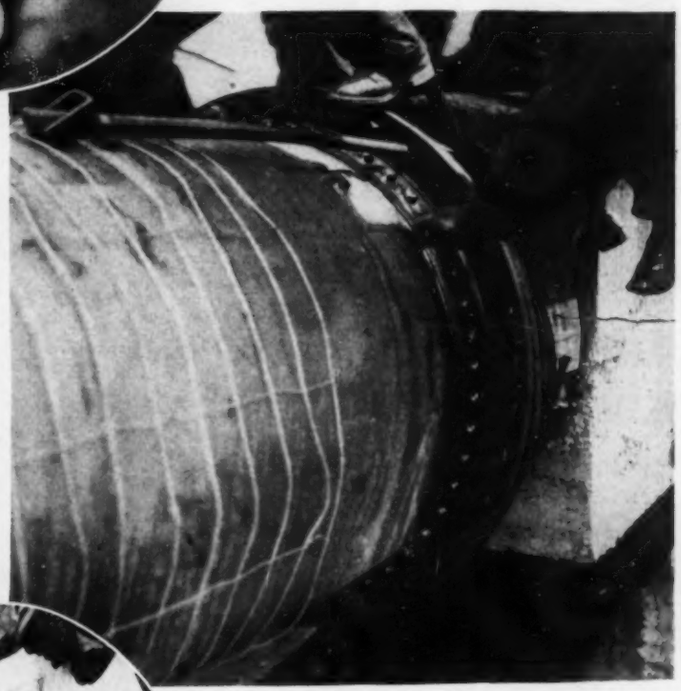
joints and the whole pipe lowered to its permanent position.

Tower Spacing — "Spacing the towers 50 ft. apart was based on the assumption that no bond existed between the steel pipe and the concrete jacket and that the load was carried entirely by the steel pipe. The pipe is covered with a protective wrapping of asphalt impregnated paper which prevents bonding of the concrete to the steel. A calculation indicated an extreme fiber stress in bending of 7,000 lb. per square inch and a shearing rivet stress of 11,000 lb. per sq.in. No cracks appeared in the concrete, and no deflection of the pipe between the towers could be observed."

PLACING RUBBER GASKET *(right)* in flanged joint before bolting up the flanges.



TO PULL SUSPENDED END SECTION into contact with center section at second flanged joint, long bolts of smaller diameter than holes are inserted through flanges.



HOLES ARE LINED UP before placing bolts in first flanged connection.

The river crossing is between the towns of Belleville and North Arlington. A section 266 ft. long was suspended from towers on the North Arlington side and was encased in concrete for its entire length. This section was anchored in place. The second end section, 156 ft. long, was hung from winches on the Belleville side and was free to move longitudinally. Steel flanges containing 36 spaced holes for $1\frac{5}{8}$-in. bolts were riveted to the adjacent ends of the pipe sections.

Load on Winches—The concrete encased pipe weighs about 1,500 lb. per linear foot, and the total weight of the pipe, from bank to bank, is about 380 tons. Fourteen Dobbie winches distributed over the ten towers supported the pipe. The loads on the towers varied from 30 to 70 tons; but, as the hoisting falls were six-part lines, the load on each winch was only about 11,000 lb.

A clearance of 5 in. was left in the channel opening to allow for insertion of the 90-ft. pipe section. A derrick boat floated the center section into the channel and picked it up with bridle sling to place it between the end sections. The connection to the anchored end section was made first, a rubber gasket being installed and $1\frac{5}{8}$-in. bolts inserted and tightened without difficulty.

DRAWING FLANGES TOGETHER by tightening bolts at connection between center section and free-hanging end section.

The lighter, free-hanging end section, on the Belleville side, was pulled into contact with the center section by tightening up on $1\frac{1}{4}$-in. bolts, 9 in. long, inserted through the flanges of the two sections. After the flanges had been drawn together and the rubber gaskets had been installed, the larger $1\frac{5}{8}$-in. bolts were placed in as many holes as possible, and the smaller $1\frac{1}{4}$-in. bolts were left in the remaining holes.

Lowering the Pipe—Each winch was manned by a crew of three: two men on the cranks turning the drum, and a third on the brake. At a signal given by Paul Jones, superintendent in charge of laying the pipe, the men on the winches lowered away for five revolutions. The winches were geared to lower the bottom blocks of the six-

part hoisting falls 1 in. in five revolutions. Thus the rigid pipe dropped uniformly 1 in. at a time from its first position a few inches above high tide to its final position on the caps of the pile bents.

The contractor's plan in lowering the pipe was to start the operation at high tide, when water almost touched the pipe and when buoyancy quickly reduced the load on the hoisting falls as the main was lowered. Delay in making the second flanged connection

AT LOWERING OF FIRST MAIN *(left to right)*—Henry Kreiger, councilman, Kearny; J. Wm. Griffin, water engineer, Kearny; Charles Marquad, water commissioner, Kearny; J. A. Armstrong, resident engineer; Andrew Prezioso, treasurer, Spiniello Construction Co.; Paul J. Jones, superintendent; Lawrence Lothian, inspector; Virgilio J. Spiniello, president, Spiniello Construction Co.; Wm. F. Jones, designer of method.

SIX-PART LINE from winch, shackle bolt, and sling used to suspend steel pipe, encased in concrete, from tower.

caused the lowering crew to miss the high tide at 2 p.m. on July 27, and the final lowering was postponed to the next high tide at 4 a.m. Sunday. On Saturday, August 31, the second pipe was closed and lowered to place in a total working time of 3 hours, the flanged joints being bolted up in 1 hour and the 510-ft. main lowered to its foundation in 2 hours. The 90-ft. center sections and the flanged joints were encased in concrete placed by tremie.

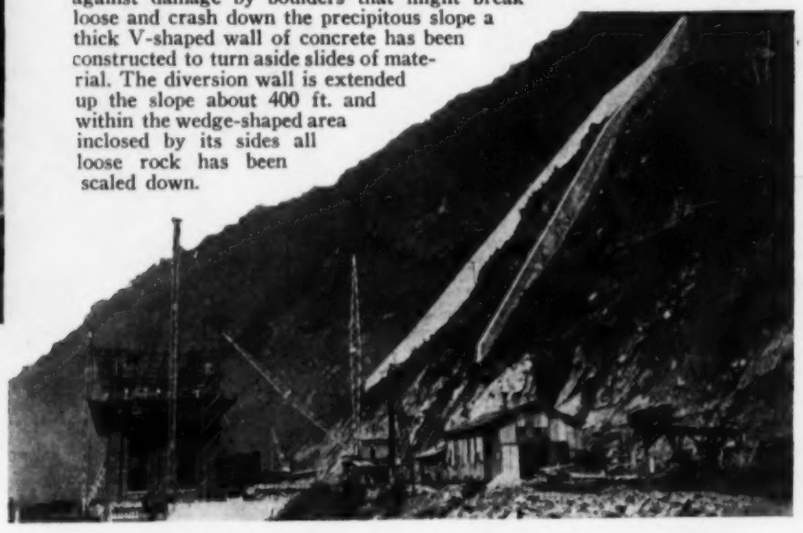
Personnel—The contractor for this work was the Spiniello Construction Co. of Newark, N. J., Virgilio Spiniello, president, Andrew Prezioso, treasurer, Judson K. Stickle, chief engineer. The method used by the contractor was devised by William F. Jones. Paul J. Jones was directly in charge of construction, with Thomas J. McCarthy acting as engineer. The contract plans were designed by Messrs. Kreiner, Taylor and Scrimshaw, associated engineers for the Town of Kearny. J. A. Armstrong was resident engineer, and J. W. Griffin, water engineer of Kearny, acted in an executive capacity.

SHIMS UNDER WIRE ROPE around bottom of pipe distribute load of 34 tons over wider area and prevent cable from cutting into ½-in. steel plate. The sling is encased in concrete.

IN NEW ROLES. Road building equipment performs emergency service in fighting Mediterranean fruit fly pest in Florida. Infected oranges and grapefruit are mashed in crusher operated by Caterpillar tractor (*right*) and buried in pit dug by bucket (*below*) on Universal crane.

Photos from L. C. RENNIE, Orlando, Fla.

TO DIVERT TUMBLING ROCKS (*below*). A new hydro-electric power house constructed by the Aluminum Company of America, at Calderwood, Tenn., stands at the bottom of a 55-deg. mountainside slope. As a protection against damage by boulders that might break loose and crash down the precipitous slope a thick V-shaped wall of concrete has been constructed to turn aside slides of material. The diversion wall is extended up the slope about 400 ft. and within the wedge-shaped area inclosed by its sides all loose rock has been scaled down.



JOB ODDITIES

A Monthly Page of Unusual Features of Construction

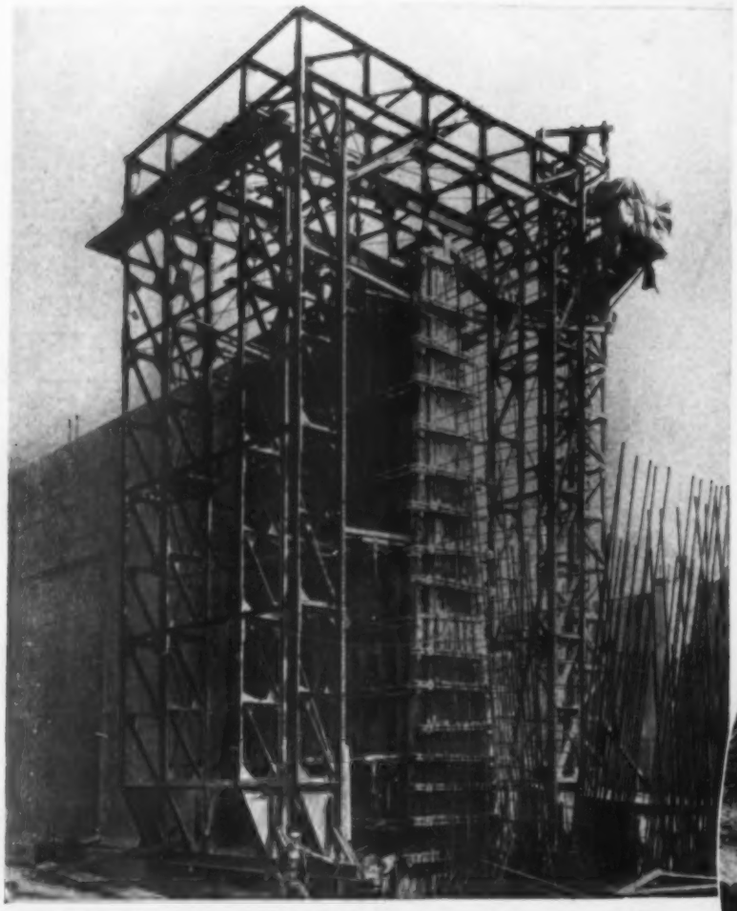
PROTECTED BY SPECIFICATIONS. Huge oak at Thomasville, Ga., shading an area of ½ acre and claimed to have the largest limb spread in the world, was made the subject of a special clause in the contract awarded to the Wesco Co. for paving the street on which it stands. The city specifications read as follows:

"Special construction will be required in the vicinity of this tree and shall be as directed by the engineers.

"No excavation shall be made within a ten (10) foot radius of the base of the tree, and no machinery using steam, or other things liable to injure the tree, shall be used within a one-hundred (100) foot radius.

"All work in the above outlined area is to be hand work and exactly as directed."

Getting Down to DETAILS



TRAVELING GANTRY FORMS of Turner Construction Co. pour to full height the 40-ft. reinforced concrete retaining walls of 125,000-ton rock storage bin at United States Gypsum Co.'s new East Chicago plant. Bin is 460x104 ft. Two sets of forms handle 15,000 yd. of concrete in walls, which are built in 20-ft. sections.

GROOVED ROLLER compacts earth on new water supply dam being built for the City of Johnstown, Pa. Six Caterpillar tractors are at work on this project, moving, spreading, and rolling earth.

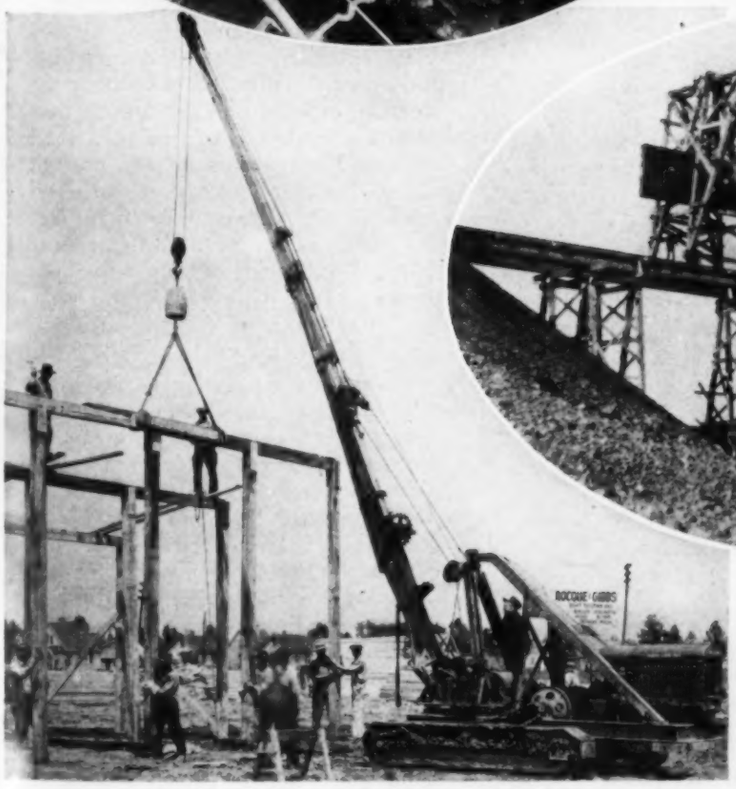
TWIN - DERRICK TRAVELER (*below*), with 90-ft. booms and 12-ft. outrigger goosenecks, makes quick work of erecting in 70 days structural frames for seven buildings of Columbia Steel Co.'s new tin plate mill at Pittsburg, Calif. Joe Gerrick & Co. were the erection contractors.

Photo from
JOE GERRICK
Joe Gerrick & Co., San Francisco

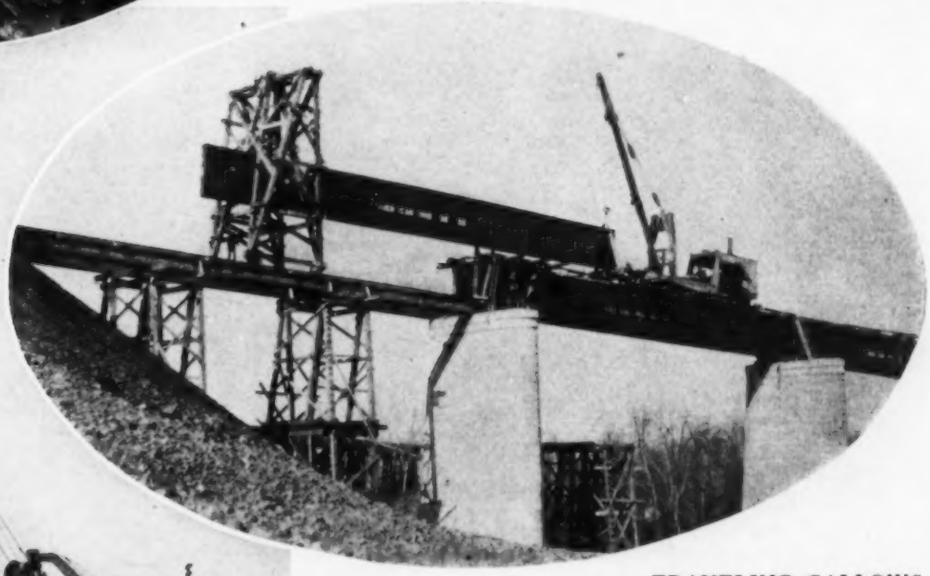
Close-up Shots of Job Methods and Equipment

STEEL TRENCH SHIELD (*below*) attached to lower end of Buckeye excavator boom (*right*) retains caving walls of trenches 5 to 14 ft. deep in sandy soil and permits contractor to lay 375 ft. of 6- to 15-in. pipe a day without use of wood sheeting.

TRENCH EXCAVATOR pulls shield easily and enables Hahn Construction Co., Milwaukee sewer and water main contractor, to work in wet, sandy soil with a small crew of men and without sheeting the banks. Gasoline-operated diaphragm pump is carried on steel platform bolted to the boom of the Buckeye trencher.



EXTENDED SHOVEL BOOM (*left*) of standard Bay City tractor shovel sets timbers for framework of new boxing arena at Michigan State Fairgrounds, Detroit. Rocque & Gibbs operate shovel under sub-contract with J. A. Utley, construction engineer, Detroit.



TRAVELING GALLOWS FRAME (*above*) and light derrick car place 125-ft. girders weighing 68 tons on Pennsylvania Railroad bridge near Marshall, Ill. Fresh fills on approaches prohibit use of heavy derrick car. Kelly-Atkinson Construction Co., Chicago, erection contractor.

Building 22 Miles of TILE BLOCK SEWER

IN BUILDING 115,000 ft. of tile block sewer, varying in diameter from 108 in. to 42 in., for the village of Lombard, Ill., Dowdle Brothers' Co., Chicago, the contractor, is using both tunnel and cut-and-cover construction. Large diameter sewers, in tunnel and trench, are constructed by laying the blocks in place; but the smaller diameters, all in open cut, are built of preformed sewer segments placed by crane. The total length of sewer in Dowdle Brothers' Co.'s contract is 140,000 ft; 25,000 ft. of 36-in. diameter and smaller is vitrified clay pipe.

About 4,000 ft. of 108-in. sewer is being built in a tunnel driven through stiff clay in two directions from a 14x16-ft. single-cage shaft 33 ft. deep. The average depth to the grade line is 33 ft. As the photograph indicates, the tunnel is half-timbered. Pneumatic spades normally used for excavation supply enough air to ventilate the bore.

Tunnel Operations—Three 8-hour shifts operate at each face. The midnight to 8 o'clock crew drives the top heading and sets the timber bracing; the 8 to 4 shift takes out the bottom, and the 4 to 12 force lays up the tile block. Normal progress is 25 ft. a day in each heading. Some soft spots and sand pockets requiring a full-timbered section have been encountered. These spots never have been serious enough to delay normal progress.

Muck is hauled by mules to the shaft in ½-yd. V-type roll-over dump cars. The cars are run out on a tipple at the top of the shaft, and the muck is dumped into trucks below. A 55-hp. Thomas electric hoist operates the cage, and air for pneumatic tools is supplied by an Ingersoll-Rand compressor, also driven by electric motor, having a capacity of 750 cu.ft. a minute. Of the 36 Lakewood ½-yd. cars on the job, 28 are used in the headings, and the balance, converted into flat cars, transport blocks on the tile layers' shift.

BACKFILLER (*above*) places 220-lb. blocks in 9-ft. sewer. Lighter 120-lb. blocks are placed by workmen.

TEMPLETS (*left*) are used in constructing inverts of large diameter sewers. Walking 2-yd. Diesel dragline excavates the trench.

Steel angle rings to support the lagging for the arch are a great aid to speedy construction of the 108-in. diameter sewer, both in the tunnel and in open cut. To facilitate handling and erection, especially in the tunnel, these rings are made in three parts, a semicircle and two quadrants. In the tunnel, the bricklayers complete the invert, place the bottom semicircles of the steel rings, and set up the arch quarters on the semicircles. Lagging to support the arch tile is placed as the tile is laid up. Voids behind the tile are filled with concrete.

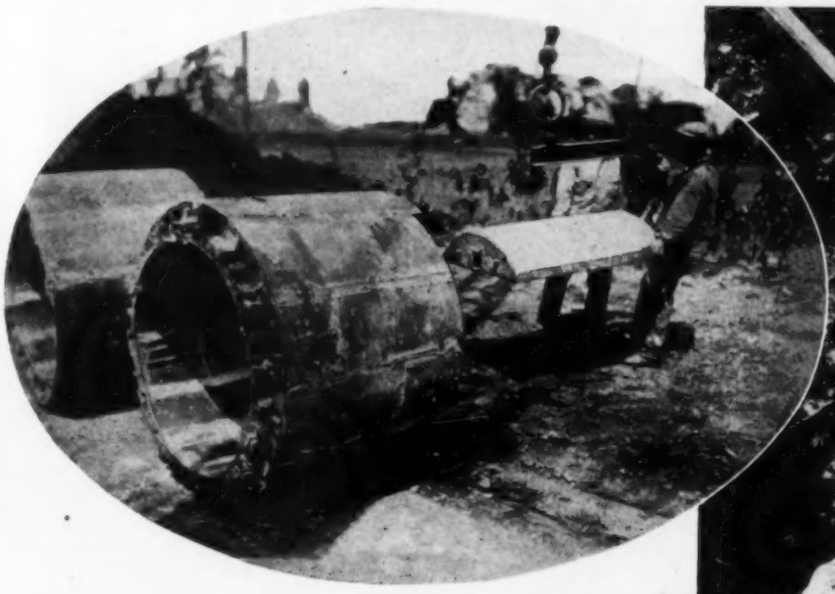
Excavating Equipment—Soil conditions in the territory through which the sewer is being laid did not warrant the use of a trench excavator for the open cut work. Dowdle Brothers' Co. is operating seven draglines, a Page 2-yd. Diesel and six Northwest 1-yd. gasoline machines. A sub-contractor who is laying the pipe of 30-in. diameter and smaller, however, is doing all his excavating with a ditcher. The draglines found good digging in all but a few places, where they struck sand. Depth of cuts vary from 8 to 32 ft. Although much of the soil is of a character which would permit use of the faster trench excavator, the slower

dragline makes up the difference in time on the sections where the banks cave. Two cranes usually work together in each open cut outfit. One digs the trench, and the second handles the sewer segments and does the backfilling.

Sewers from 90 to 72 in. in diameter are constructed by laying tile blocks in place, as in the 108-in. sewer. Instead of steel rings, however, movable forms support the arch during construction. The lower half of the sewer is built with the aid of templets set to line and grade.

Two sizes of tile blocks—120-lb. and 220-lb.—are used in the section of 108-in. sewer being built in open cut. The lighter 120-lb. block is much easier to handle than the larger size, and the workmen make better progress when laying it. Shortage of the smaller blocks, however, caused the contractor to order enough of the heavy tile to supply the deficiency. As bricklayers can not handle the large blocks without great difficulty, an Austin backfiller is employed as a crane to place this tile.

Preformed Segment Construction—Sewers from 66 to 42 in. in diameter are constructed of segments made up in advance. These segments, 3 ft. 6 in. long, are built of tile blocks and are allowed to set at least 21 to 24 days before being picked up and placed in the trench by the crane. To save rehandling, they are made up and left to cure along the line of the sewer. A broad-shouldered pipe hook used in picking up the segments prevents stressing any block or joint too severely. Segments are laid on a cradle of fresh concrete spread over the bottom of the trench, and joints between sections are closed with tile chips and neat cement mortar.



SEWER SEGMENTS (*above*) of tile block made up in advance are handled by crane with broad-shouldered pipe hook.

PLACING SEWER SEGMENT on fresh concrete cradle in bottom of trench. Workman on top of main is ready to close joint with tile chips and mortar.

TUNNEL SECTION of 9-ft. sewer. Upper half of bore is timbered, and voids between tile blocks and timbering are filled with concrete.

Sewer manholes are built up with precast concrete blocks. The blocks for the cone at the top of the manholes have tongue-and-groove joints between blocks in one course.

Dowdle Brothers' Co., Chicago, as general contractor, is building the sewer for the village of Lombard, which has retained the Engineering Service Co., Aurora, Ill., to design and supervise construction of the main. For the contractor, D. J. Shirey, superintendent, is in charge of operations, and P. J. McEvoy is engineer.

BLADING TOP DRESSING of crushed stone keeps material evenly distributed until it is embedded in sand-clay or top-soil surface.

COUNTY ROAD WORK
in North Carolina

THE extensive use of plant and equipment, complete shop facilities and a thoroughly experienced organization have enabled the Mecklenburg County Highway Commission of North Carolina to produce noteworthy results in the expenditure of an average of over half a million dollars annually for the last eight years for the construction and maintenance of highways in that county.

County Road System—With the exception of the highways in the state system, all of the highways in the county are under the authority of the commission. These total more than 600 miles in an area of about 550 square miles. They include 39.35 miles of two-way hard surface, 51.4 miles of one-way hard surface, 272.7 miles of 30-ft. width with improved roadway surface, 10 miles of macadam, 99.65 miles that are only partly improved, with only a small mileage that is merely maintained.

Located in an intensive industrial and agricultural section, with the 100,000 population of the city of Charlotte near the center of the area, the traffic handled is far above the average for rural communities. In fact, many of the roads carry a through-route volume.

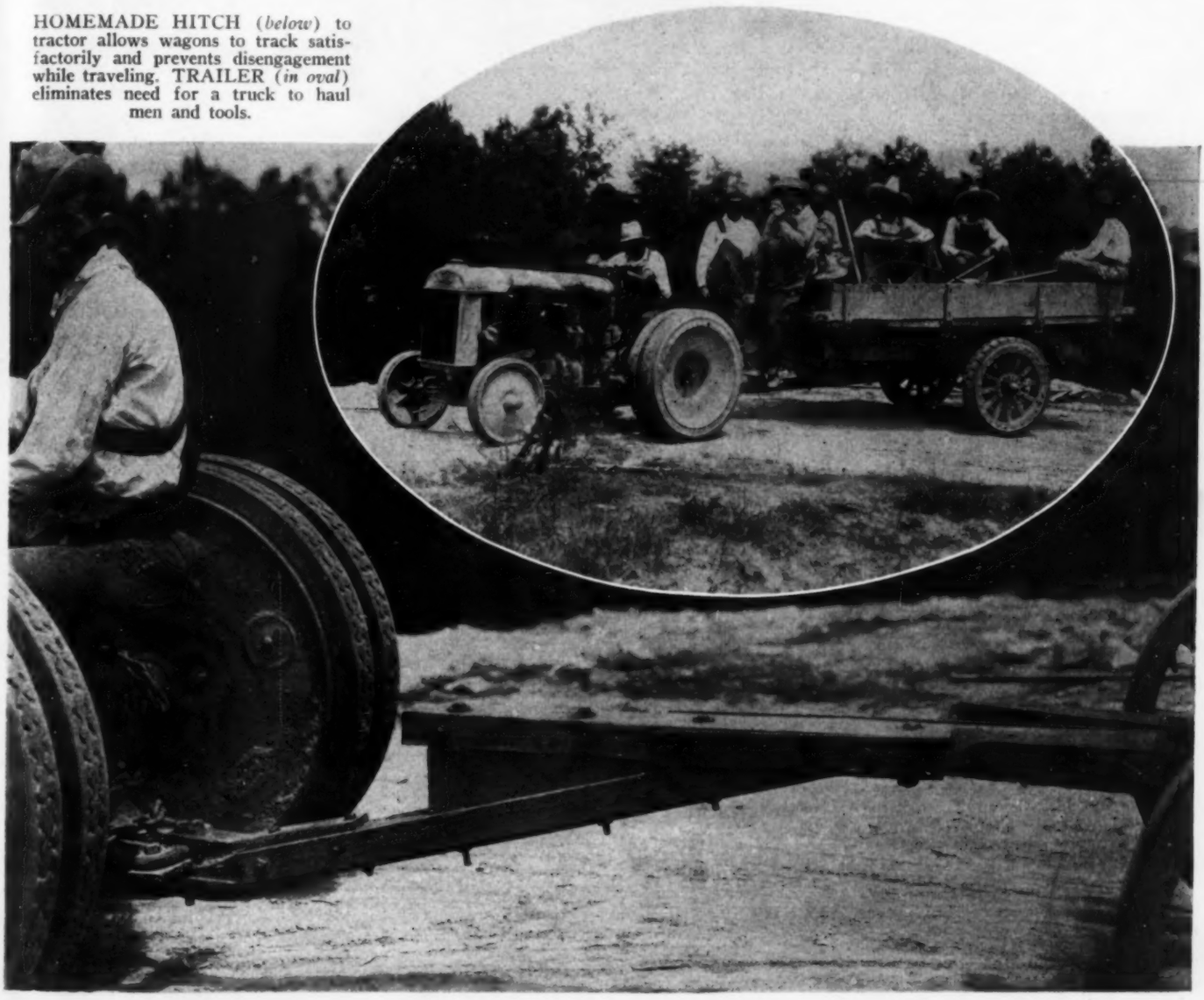
CRUSHED STONE for top dressing is delivered by tractor and two wagons which dump material in windrow on road. Two men handle all operations of hauling, dumping, and spreading.

All construction work is handled by convict labor. The commission operates four convict camps on a permanent basis. These are equipped for housing the men comfortably, the policy being to care for the convicts well. The result is that the commission gets just about as good results as it could from hired labor. At the same time, the county is entirely relieved of all expense of maintaining convicts. Practically all maintenance work is performed by employed labor.

Maintenance Organization — The superintendent of each of the eight districts into which the county is divided is responsible for the maintenance of the mileage in his district. On extraordinary jobs his regular crew of employed men is helped out by a convict gang.

Each superintendent has in his district from three to four maintenance unit outfits. Each of the latter is in charge of a foreman residing as near as practicable to the center of the mileage assigned to him. Each unit includes a Fordson tractor, equipped with weighted traction wheels and rubber tires, a 7-ft. blade grader, a drag, wheelbarrows and hand tools. Enough hand laborers are attached to each outfit to do the work beyond the range of the machines.

HOMEMADE HITCH (*below*) to tractor allows wagons to track satisfactorily and prevents disengagement while traveling. TRAILER (*in oval*) eliminates need for a truck to haul men and tools.



With the equipment available the entire system can be machined in a three-day period. Since the larger portion of the system is of sand-clay, top-soil and other earth types, this quick coverage after a wet spell is important. All units are in service a large part of the time, however, being laid up usually only in such weather as will not permit them to be worked to advantage. In 8 years they have averaged 230 working days a year.

Repair Shop—All automotive equipment is maintained and all important repairs to other plant and equipment are made in a substantial shop owned and operated by the commission. With 33 tractors, a dozen trucks and automobiles and numerous road machines in service, this shop has proved a great economy.

An idea of the thoroughness with which repairs are handled is indicated by the method used in keeping the Fordson tractors in condition. These tractors have seen from 5 to 6 years of hard service. They are kept going without difficulty by constant attention. For example, a cylinder block in good repair is kept on hand at the shop at all times. When the engine of a tractor goes bad, the tractor is sent to the shop and a rebuilt or new block substituted for the old one. In this way the tractor is out of commission a minimum time. Repairs on other equipment are similarly handled.

An unusually accurate check is kept on the cost of the repairs and maintenance of all equipment. For example, the average life of the tractor rubber

tires has been determined quite closely under different kinds of service. If a set of tires falls much under the average, the attention of the supplier is called to the fact. In case the discrepancy is great, an adjustment is required. The comparative costs of keeping up different tools and machines are followed in a similar way.

Crushed-Stone Dressing on Sand-Clay and Top-Soil Roads

Since a large portion of the system has sand-clay and top-soil surfacing, the common problem of the formation of corrugations has been serious. This problem has largely been solved by using a light top dressing of crushed stone. Experience in the methods of placing this top dressing and subsequently maintaining it is being accumulated constantly. The plan followed now, however, practically eliminates corrugations and cross ruts on good sand-clay and top-soil roads carrying up to 350 motor vehicles per day.

Round gravel will not answer for this top dressing. Crushed stone or crushed gravel that will all pass a ¾-in. ring is the most satisfactory. It is best to have a material that does not contain very much dust when reduced to this size. A stone or gravel that breaks with sharp angular edges also is preferable.

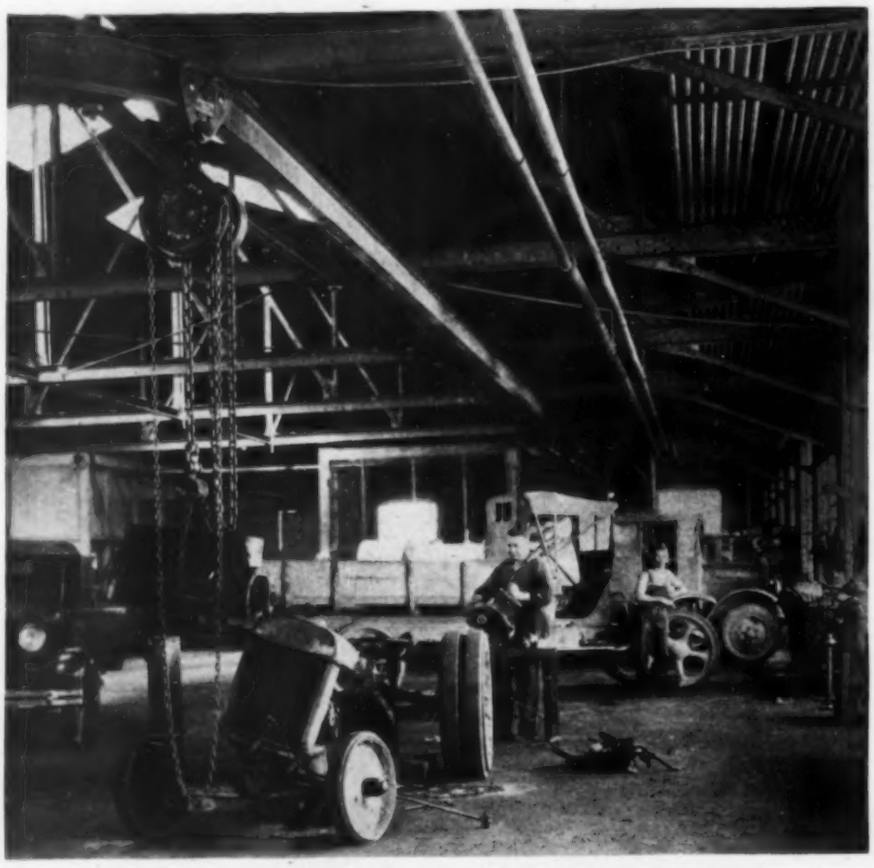
The depth placed on the road varies according to the volume of traffic and the condition of the surface. In no case is a coating of more than 1½ in. necessary. It further has been found better to apply two light coats at intervals than to put all of the crushed material on at one time, if the total depth exceeds ¾ in.

Applying Top Dressing—Prior to applying the top dressing no special work is done on the road surface, if the latter is in well-maintained condition. The crushed material from the quarry is delivered directly to the road in ordinary horse dump wagons drawn in pairs by a Fordson tractor. One man drives the tractor, while a second rides the wagons to operate the dumping device. The stone is placed evenly along the road in a windrow from the wagons with the tractor in motion. The two men then spread the stone with hand shovels, no gang being kept at the point where stone is being distributed. Good distribution is obtained in this rather simple manner at nominal cost.

No rolling of the dressed surface is done, the traffic being allowed to work the crushed stone into the sand-clay or top-soil. A blade grader drawn by a tractor is run rather constantly over the newly dressed surface to keep the material evenly distributed until it is all bedded in the surfacing. The crews acquire skill in handling these operations until the final surface has the appearance of a deep gravel or crushed stone road. There is the advantage over ordinary macadam, however, in that the crushed material once bedded in the sand-clay or top-soil stays in place remarkably well.

Hauling Conditions—One of the outstanding features of this work is the hauling of the stone as much as 6 to 10 miles in the dump wagons drawn by the tractors. It is the preference of the commission to keep the haul within 6 miles. With a crusher plant recently put in service this will be possible on most of the main roads.

A tractor with two wagons loaded averages from 3 to 4 miles per hour, depending on the grades. Returning light, the driver lets the tractor out to a speed of from 5 to 6 miles. Care is used to keep the wagons well greased. On long hauls this has to be done at the end of the trip each way. Some experimenting has been done with roller bearings on the wagons. The data thus far obtained are insufficient to determine whether these higher-type bearings would pay as compared with ordinary steel skeins.



WELL-EQUIPPED SHOP makes speedy repairs and keeps all equipment in good condition.

The commission has found that under its conditions the use of tractors and wagons is preferable to dump trucks, especially for hauls under 5 miles. Top dressing operations are intermittent and there is little service to which the trucks could be placed at other times. On the other hand, the tractors are used extensively in pulling the road machines. With the total number the commission has it usually is possible to release from maintenance work those necessary for hauling.

The commission also has worked out a low-cost single-axle two-wheel rubber-tired trailer that is used to good advantage on both construction and maintenance operations. One of these, shown in an accompanying picture, was built by the commission's forces out of a castoff truck at a total cost of about $100. It is employed to take men, tools and light supplies to and from the job. With the tractor making 7 miles in high this trailer reduces lost time to the minimum and eliminates the need of maintaining a motor truck.

Personnel—The Mecklenburg Highway Commission consists of Thos. Griffith, J. R. Withers and A. J. Draper, who have all served since the creation of the commission in 1921. L. McC. Ross has likewise been engineer and G. D. Bradshaw has been secretary of the commission from the time that it began to function.

Present and Accounted For —

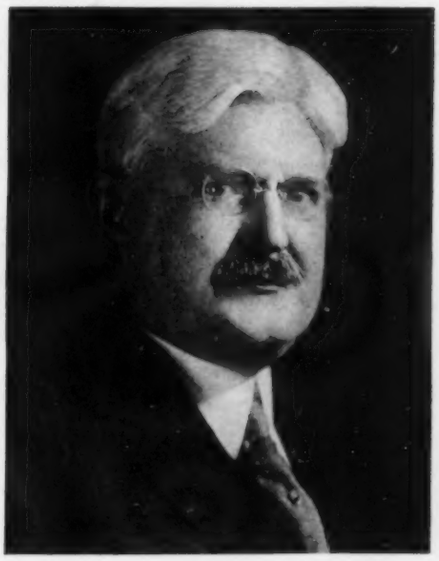
A Page of Personalities

HERMAN STOKES (*right*), while working as a power-shovel operator on a New England tunnel job, performed an act of courage and self-sacrifice that one of his friends tells about in these words: "He came East from the Moffat tunnel with a buddy, who worked on the same job with him as shift boss. One day, as the shovel dipper started to bite into the pile, there was a blinding flash and a deafening roar—a 'missed' shot had exploded. He came to on the tunnel floor with a terrific pain tearing at his vitals—a 75-lb. rock had hit him square in the middle, a piece of it going right through. He saw his pal lying motionless near by and tried to lift him, but couldn't on account of his own severe injuries. Blinded by smoke and gas and stunned with the pain of his own wound he staggered back through the tunnel to summon aid for his pal. Meeting a worker rushing in to see what had happened his first words were: 'Don't mind me—go get Mac.'

"A skillful operation and months in the hospital saved his life. He went back to the job. They wanted to give him work outside, but your real tunnel man dies hard. He got back into the 'hole' and carried on with the mucking until the job was completed. A fine exhibition of nerve and courage."

COL. MAX C. TYLER, Corps of Engineers, U. S. A., has assumed new duties as chief engineer of the Federal Power Commission, Washington, D. C. He was formerly in charge of the water supply system of the District of Columbia and served, also, on the hydro-electric construction at Muscle Shoals, Ala.

MAJOR - GENERAL LYTLE BROWN, named by President Hoover to become Chief of Engineers, U. S. Army, succeeding Lieut.-Gen. Edgar Jadwin, retired. He is a native of Nashville, Tenn., and at the time of his promotion was in command of Fort Davis, Canal Zone. He has been in charge of the U. S. Engineer districts at Nashville and Chattanooga.

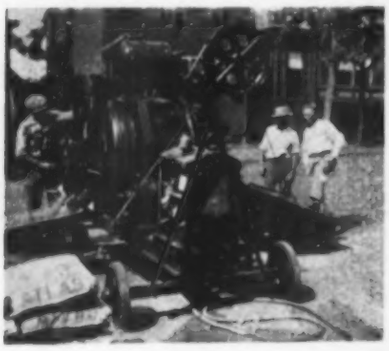


ROBERT SPURR WESTON, elected president of the New England Water-Works Association. Mr. Weston is senior member of the firm of Weston & Sampson, consulting engineers, of Boston. He has designed and supervised many important projects for water supply, sewerage and the disposal of industrial wastes.

NEW EQUIPMENT ON THE JOB

Speedy 7-S Mixer

A 7-S mixer which meets the specifications of many contractors is now manufactured by the Ransome Concrete Machinery Co., Dunellen, N. J. The mixer handles a two-bag batch of

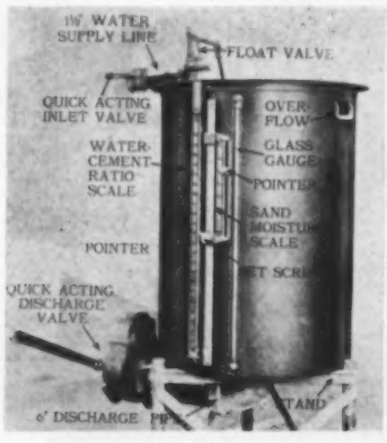


1:1½:3 concrete, turns in a radius of 13½ ft., lifts a power loading skip in 7 to 8 sec., and empties a batch in 7 to 9 sec.

Aids Water Control

A water-measuring tank to control the water-cement ratio is announced by the Blaw-Knox Co., Pittsburgh. The tank is made in two models, manual and automatic.

The manually operated tank is equipped with two scales. The operator first sets the pointer on the water-cement

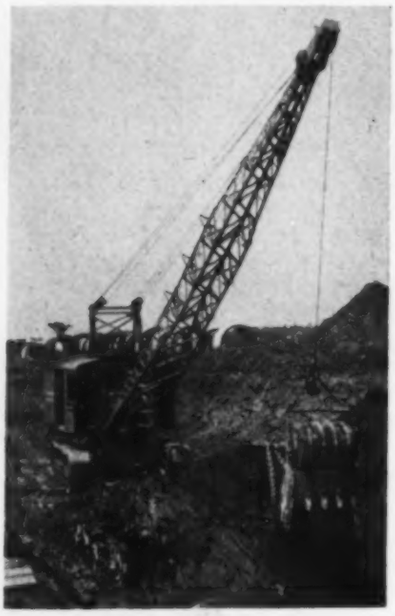


ratio scale and then sets the pointer on the auxiliary scale to make allowance for the moisture in the aggregate. In discharging, the operator closes the valve when the water in the glass gage drops to the proper level.

In the automatic tank, an adjustable overflow funnel regulates the filling of the tank to the proper level, and the entire contents of the tank are discharged into the mixer.

A 1¾-Yd. Dragline

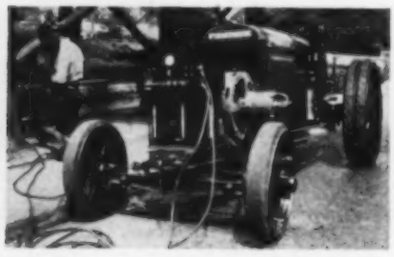
The new 1¾-yd. dragline of the Northwest Engineering Co., Chicago, can be loaded on one flat car. Standard length of boom is 50 ft. Designed for



drainage, sewer, and irrigation work, the machine can be converted to a crane by changing buckets or to a trench pull-shovel by changing booms. A broad, stable base, positive traction and accelerator-controlled gasoline motor are features of the dragline.

Mobile Welding Unit

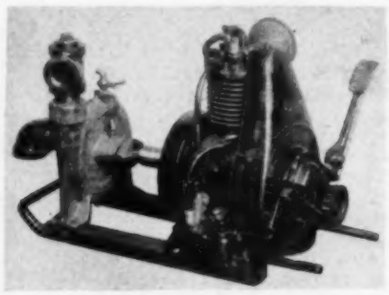
A compact, mobile welding unit of 200 or 300-amp. capacity is offered by the Pontiac Tractor Co., Pontiac,



Mich. The wheelbase of a McCormick-Deering tractor is lengthened with a 4-in. I-beam frame, and a Lincoln welding machine is placed on this frame ahead of the tractor. The welder is driven by belt from the tractor's power pulley.

Portable Centrifugal Pump

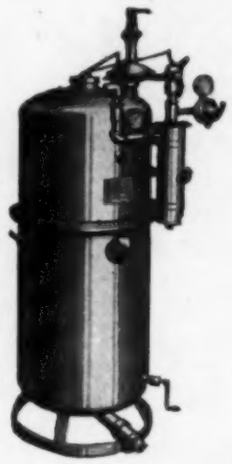
Lightweight, open impeller type centrifugal pumps direct connected to air-cooled gasoline motors have been announced by Union Iron Works, Hoboken, N. J. The 105-lb. model pumps



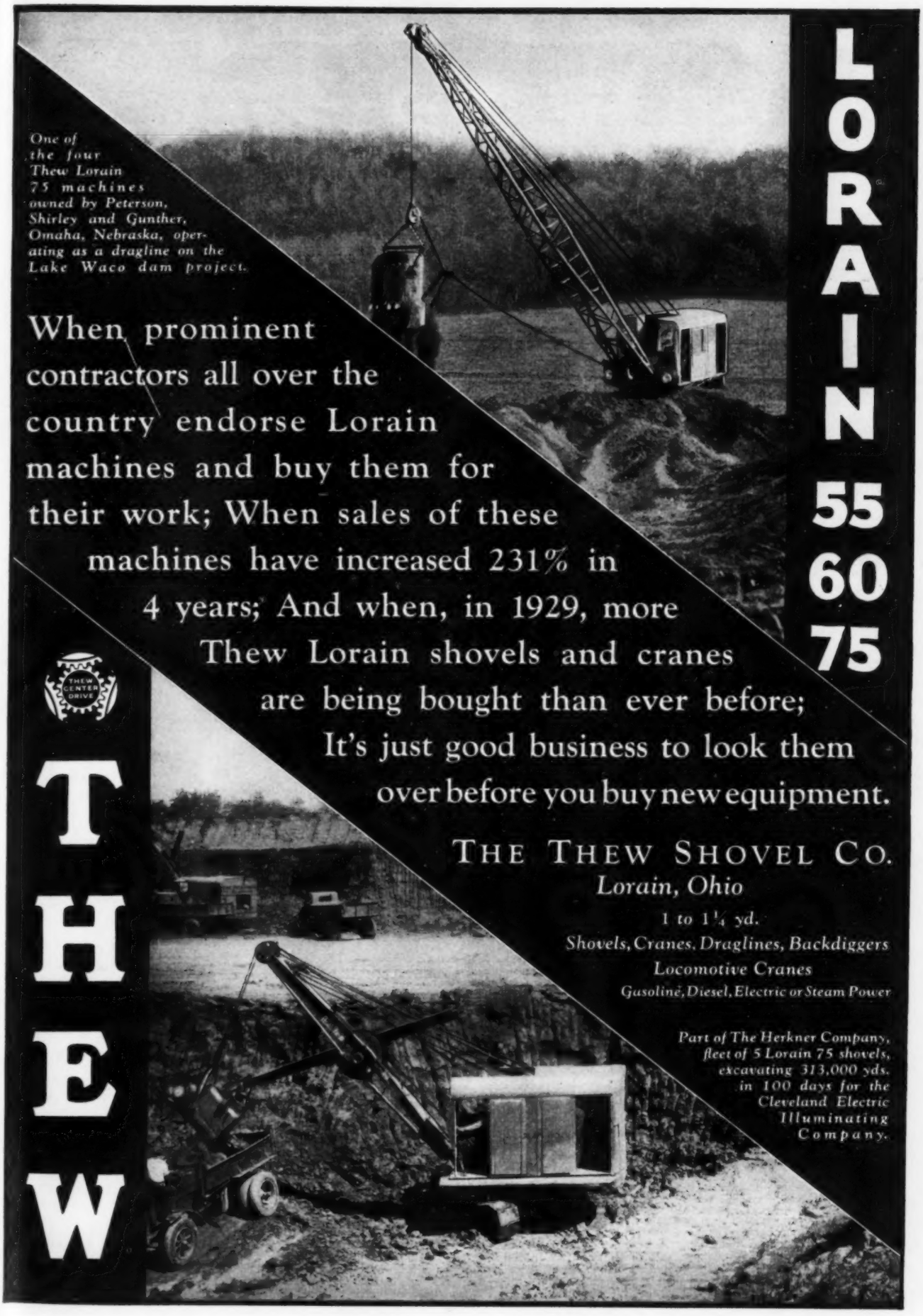
2,500 gal. per hour at a 20-ft. head and 350 gal. at a 30-ft. head; the 180-lb. size pumps 8,250 gal. at a 20-ft. head and 500 gal. at a 55-ft. head. Both models handle 25 per cent of solids without clogging.

Portable Acetylene Generator

The new portable acetylene generator of the Alexander Milburn Co., Baltimore, Md., has a body of drawn seamless steel. Three capacities—35



lb., 70 lb., and 100 lb. are available. The carbide hopper feed control and head are in one unit bolted to the body. A single valve controls carbide feed. Blow-off valves, pressure control, gas purifier and strainer are standard equipment. The makers state that the new generator produces gas for approximately 1⅛c. per cubic foot.



One of the four Thew Lorain 75 machines owned by Peterson, Shirley and Gunther, Omaha, Nebraska, operating as a dragline on the Lake Waco dam project.

LORAIN 55 60 75

When prominent contractors all over the country endorse Lorain machines and buy them for their work; When sales of these machines have increased 231% in 4 years; And when, in 1929, more Thew Lorain shovels and cranes are being bought than ever before; It's just good business to look them over before you buy new equipment.

THEW

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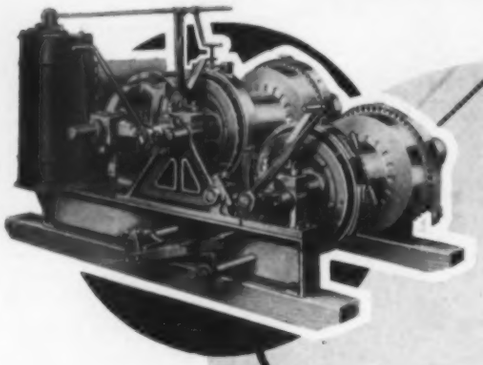
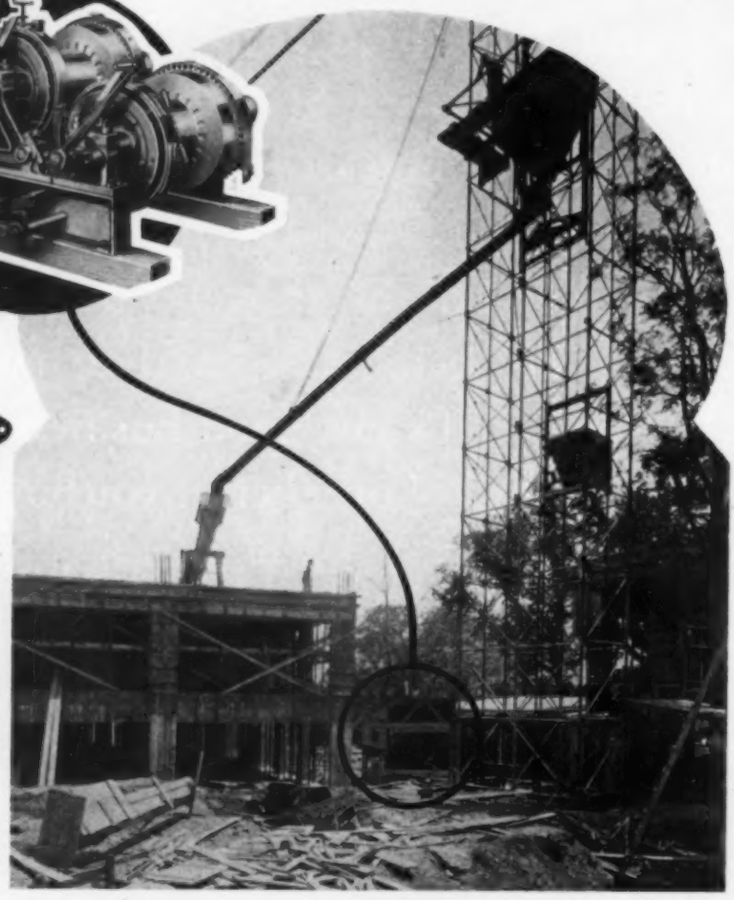
Part of The Herkner Company, fleet of 5 Lorain 75 shovels, excavating 313,000 yds. in 100 days for the Cleveland Electric Illuminating Company.

CLYDE HOISTS-DERRICKS

- satisfactory equipment -

For the erection of three large apartment units at Kansas City, the C.O. Jones Building Co. needed fast, dependable equipment. A Clyde two drum electric hoist was used to operate the elevator and concrete bucket at the central mixing plant. 16,000 yards of concrete were required on this job and the performance of the complete installation gave absolute satisfaction.





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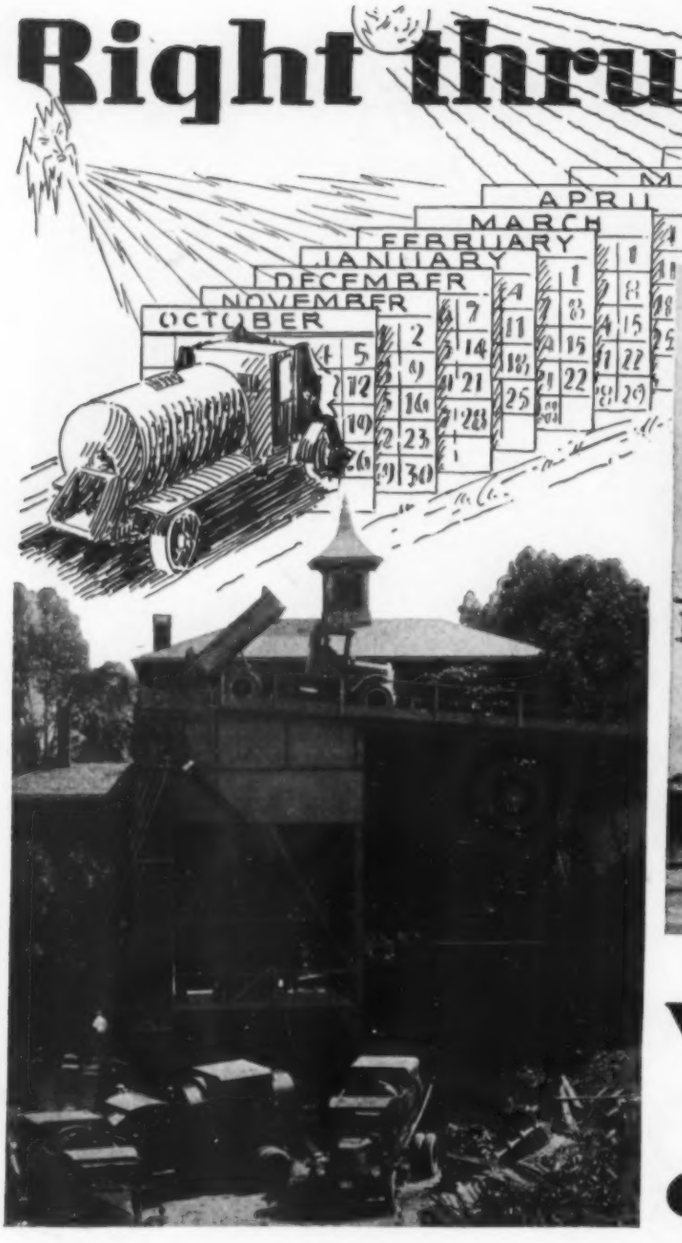
27 West Illinois St., Chicago, Ill.
203 Perry Payne Bldg., Cleveland, O.
122 So. St. Clair St., Dayton, Ohio
5423 12th St., Detroit, Mich.
6122 Parkhill Ave., Milwaukee, Wis.
152 Chambers St., New York, N. Y.
313-319 New St., Philadelphia, Pa.
300 Penn Ave., Pittsburgh, Pa.
221-223 No. 3rd St., St. Louis, Mo.
415 Michigan St., Toledo, Ohio

Continental Rubber Works - Erie, Pa.

Chas. C. Kerner, 152 Chambers St., New York, Exclusive Foreign Representative

Right thru the year-



with a BUTLER Commercial Concrete Plant

Commercial concrete production is a year 'round business.

Butler Plants—for central mixing or transit mixing—are in successful operation in all parts of the country. Each Butler Commercial Concrete Plant is giving typical Butler satisfactory service.

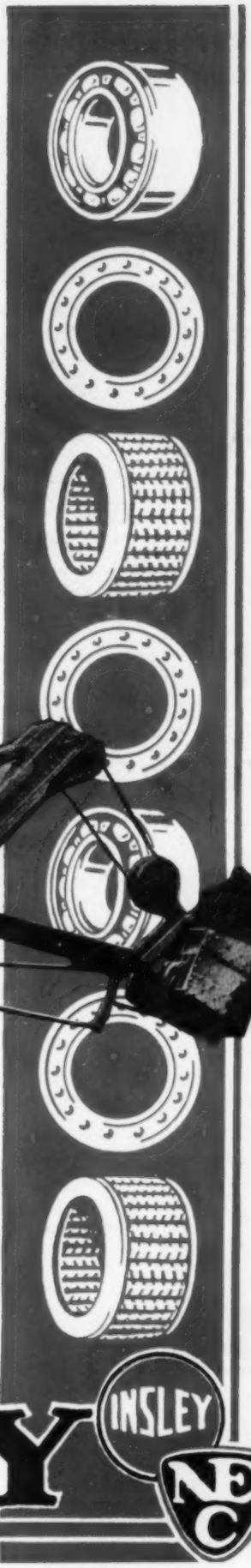
Our engineering department is in close touch with commercial concrete developments and will be glad to consult with you at any time.

BUTLER BIN COMPANY
WAUKESHA WISCONSIN
Representatives in fifty principal cities

BUTLER
Steel ***BINS***

BUTLER BIN COMPANY · WAUKESHA, WIS.

INSLEY *frictionless bearing* PERFORMANCE



WHAT do frictionless roller bearings and ball thrust bearings on the Half Yard Insley mean to the Insley owner?

First—that the Insley delivers more pounds of line pull per horse power of the engine.

Second—that the Insley develops the greatest possible operating speed.

Third—that it maintains this operating speed daily throughout the season with the lowest possible expenditure for wear and tear.

Fourth—that the bearings can stand the abuse and neglect of a careless operator without deteriorating.

Fifth—that the Insley operator can operate his machine at top speed and maintain that speed hour after hour throughout the day without fatigue.

These benefits combined together give the Insley owner the utmost performance at the lowest cost—and the satisfaction of owning the only half yard ball and roller bearing shovel on the market.

And yet frictionless bearings are only one of many up-to-date features you get on the Insley that place it in a class by itself.

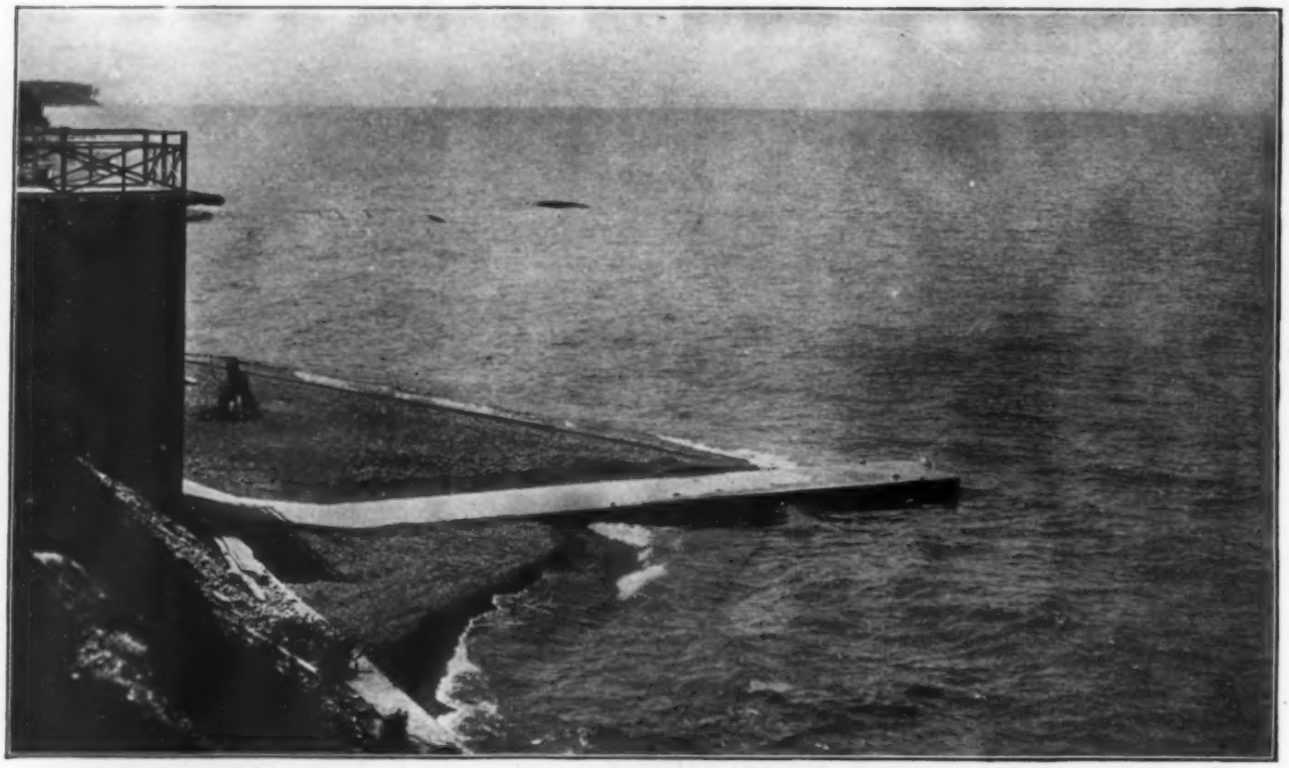
INSLEY MANUFACTURING COMPANY
Indianapolis, Indiana
Division of National Equipment Corporation

INSLEY

INSLEY
NEC

730

Made with "INCOR" Brand Perfected High-Early-Strength Portland *Cement, this concrete pier withstood a severe storm which destroyed a nearby pier built at the same time with ordinary portland cement.*



24 hour concrete

made with "INCOR" Brand Portland Cement solves the time problem for Architect and Engineer

IN every type of concrete construction where it is necessary to save time without sacrificing permanence and dependability, it pays to use "INCOR" Brand Perfected High-Early-Strength *Portland* Cement.

"INCOR" Brand combines the outstanding quality and uniformity of LONE STAR Cement, with the added advantage that "INCOR" produces concrete ready to use in 24 hours.

An interesting example of the use of "INCOR" to solve the troublesome time factor in construction is afforded by this new concrete pier on Lake Ontario, near Ft. Niagara. Here high-early-strength was necessary to prevent injury to the newly placed concrete by the pounding of the surf. The "INCOR" concrete pier developed the necessary high-early-strength—had the "ring" of 20-day concrete in 24 hours—and successfully withstood a sudden storm which destroyed a nearby concrete pier placed at the same time with ordinary Portland Cement.

Specify LONE STAR Cement for all work where time is not the principal factor. Whenever time is important, specify *"INCOR".

*Registered U. S. Patent Office

INTERNATIONAL CEMENT CORPORATION

342 Madison Avenue, New York

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Birmingham, Alabama

LONE STAR CEMENT CO. INDIANA, Inc.
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URUGUAY PORTLAND CEMENT COMPANY
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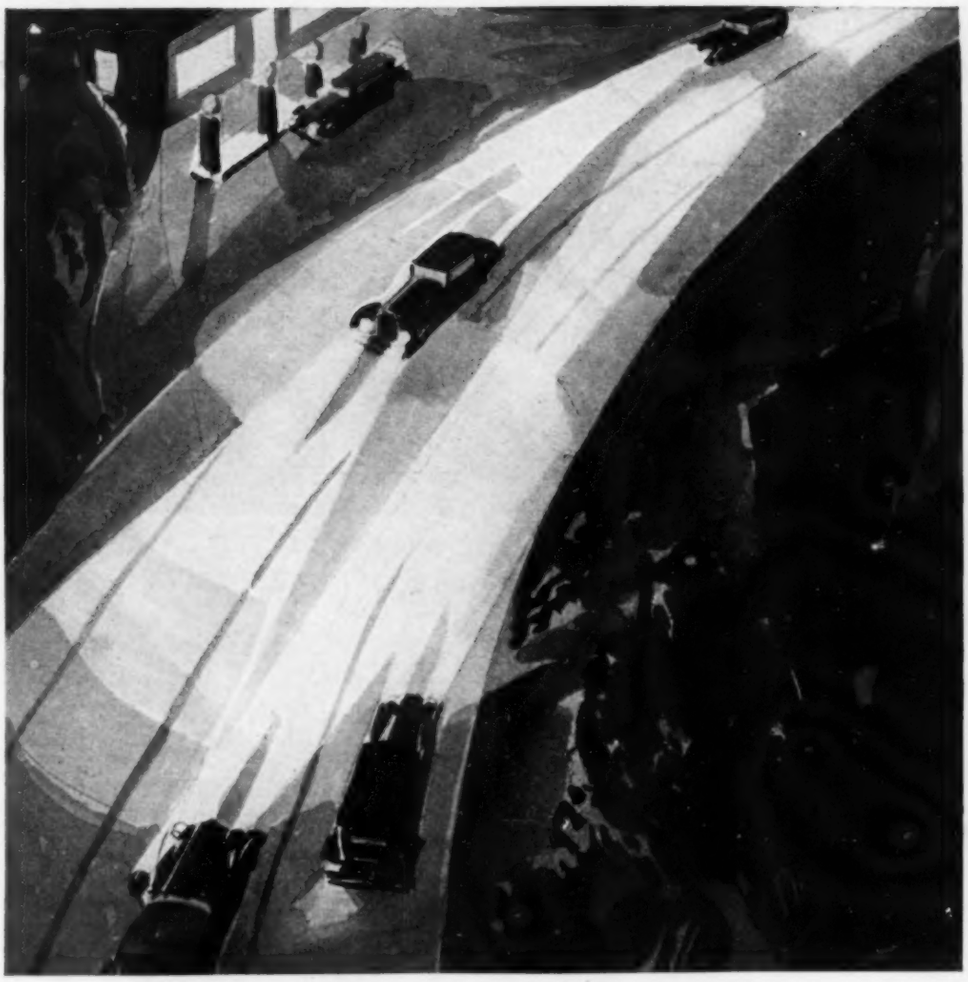
One of the world's largest cement producers—13 mills... total annual capacity 21,000,000 bbls.



Strong, safe roads—with this welded steel reinforcing

Today's increased driving speeds, slashing rain and a pitch black night make poorly-built roads doubly dangerous. Yet these natural hazards only emphasize the smooth safety of a well-built road based upon the scientifically correct reinforcing strength of NATIONAL REINFORCING.

And highway engineers who build with NATIONAL REINFORCING—build for economy as well as safety. Its welded mesh of cold-drawn steel saves tying and eliminates any possibility of slippage. Its small members, closely and accurately spaced, are more efficient than larger members spaced farther apart.

These advantages explain why NATIONAL REINFORCING is being increasingly used not only in concrete thoroughfares but also in concrete bases of asphalt, brick, and wood block streets.

Its wide variety in designs assures the correct type of NATIONAL REINFORCING to meet every road-builder's needs.

The booklets listed below on the use of fabric reinforcement in concrete road and concrete base construction will be sent free on receipt of coupon.

National Steel Fabric Company

DIVISION OF
Pittsburgh Steel Co.
4210 Union Trust Bldg. Pittsburgh, Penna.

The world's largest manufacturers of welded steel fabric

National Steel Fabric Co., 4210 Union Trust Bldg., Pittsburgh, Pa.
Send us without obligation:

1. *Application of Results from Road Surveys.*
2. *Reprint from 1929 Proceedings American Road Builders Association.*
3. *Reprint, Designing Concrete Pavement for Airports.*

Company_____

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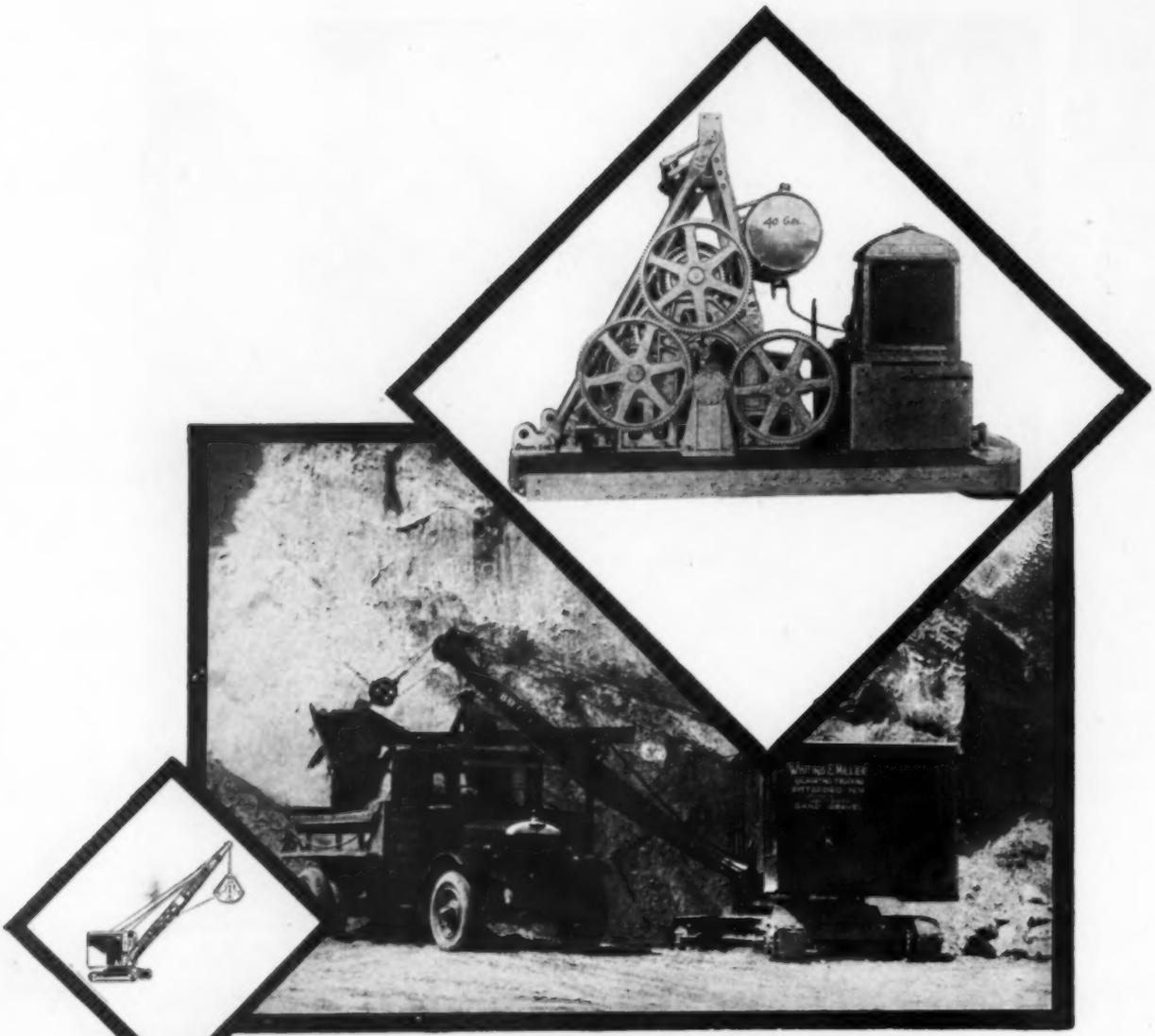
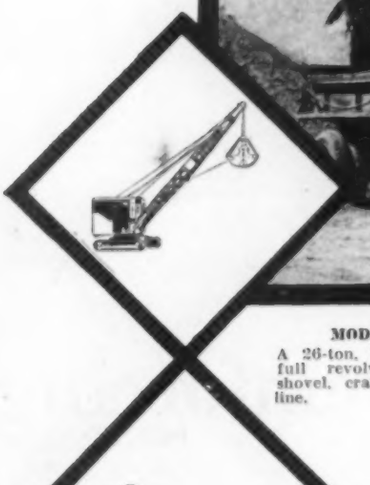
Title_____

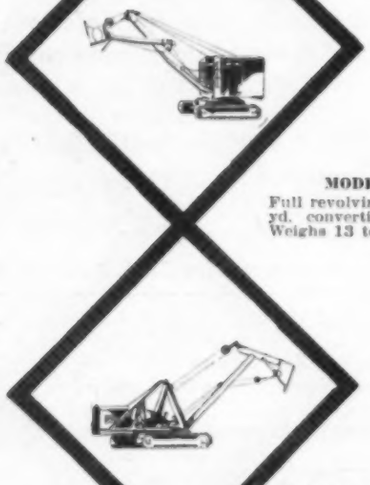
City _____ State_____



MODEL R
A 26-ton, heavy duty, full revolving ¾-yd shovel, crane or dragline.



MODEL K
Full revolving light ½-yd. convertible shovel. Weighs 13 tons.



TRACTOR SHOVEL
Recognized leader in its field. Operates shovel, Trench hoe, backfiller, etc. Weighs 10 tons.

POWER-PLUS

All present day power shovels must have *power* to meet specified capacities—but, when you buy a BAY-CITY you *buy*—POWER-*plus*.

Take for example the BAY CITY Model K.—14½ tons of concentrated power and endurance that will speed up every job within its capacity and give maximum service with increasing profits.

Every shaft on revolving table is mounted on ball-bearings. 8 inch center pin provides unusual strength, stability and safety. 6 foot diameter slewing circle—the largest in its class. Shortest tail swing—only 7 feet. Hoist line speed—150 feet per minute. Hi-manganese unit cast car body. "E-Z" Touch clutch control. Convertible to crane skimmer, trencher or dragline.

Just the light ½ yard full revolving shovel you have been waiting for. Investigate "POWER-*plus*" BAY CITY Shovels.

BAY CITY SHOVELS, Inc.

New York Office—302 Broadway BAY CITY, MICH.

BAY-CITY

The BAY-CITY family of fast workers

DRIVE

with

UNION HAMMERS

Read this high praise from Florida!

Photo shows a size 1 Union Hammer driving 18-inch square, 35-ft. concrete piles for Blue Run Bridge, Dunellon, Marion County, Florida.

The contractors are the Atlantic Dredging & Construction Co. of Auburndale, Florida. The president, Mr. Reid W. Bryan, wrote us under date of July 22, 1929, as follows:

> "This work was done for Marion County, and our Union Hammer was used with the greatest satisfaction both to ourselves and Mr. J. E. Walker, County Engineer."

Think this over when you have pile driving of any kind to do.

UNION IRON WORKS

Engineers and Manufacturers

NEWARK AND GROVE STS.
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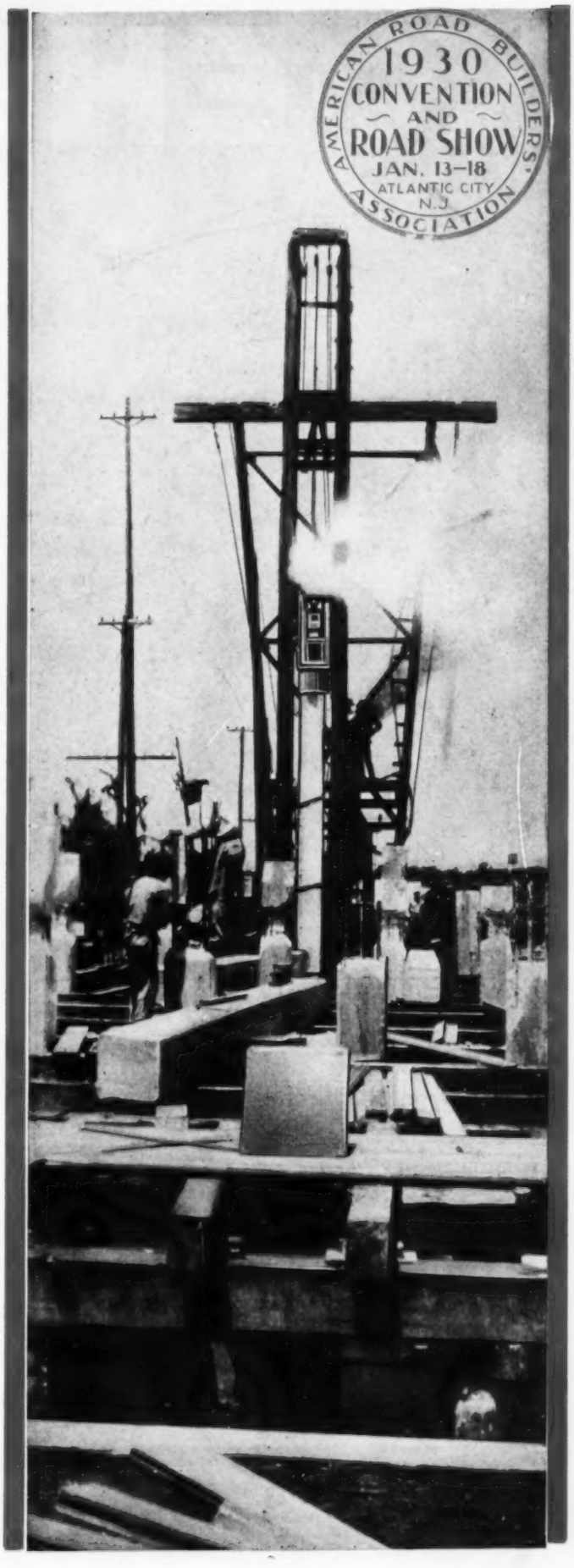
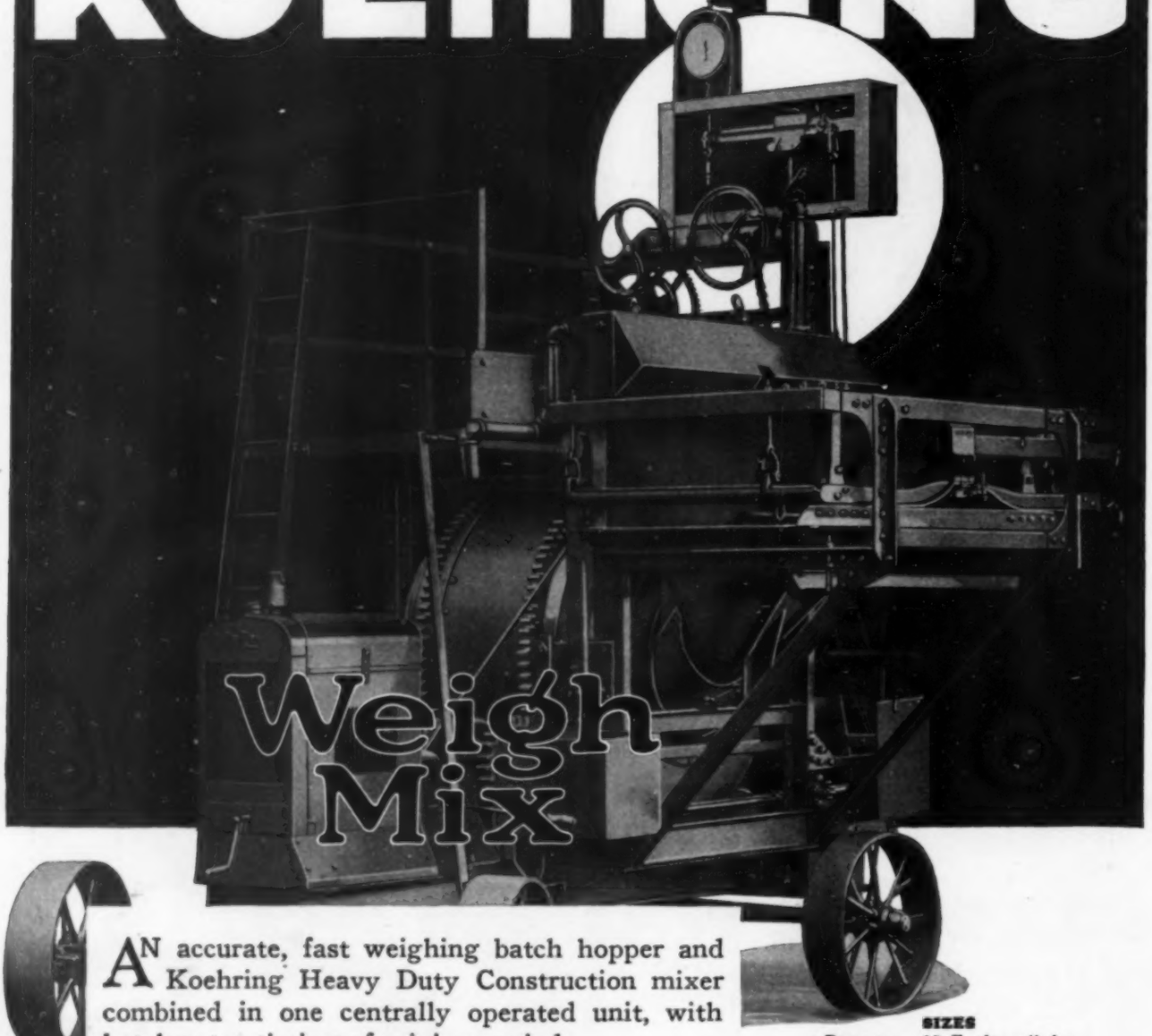
UNION
DOUBLE-ACTING
PILE HAMMERS



KOEHRING



AN accurate, fast weighing batch hopper and Koehring Heavy Duty Construction mixer combined in one centrally operated unit, with batchmeter timing of mixing period.

All materials weighed in one batch hopper, allowing for use of as many grades of aggregate as desired!

One operator easily weighs materials at speed to utilize full mixing capacity of the mixer!

Hopper door actuates batchmeter. Hopper shaking device quickly cleans hopper so that scales return to balance for weighing next batch.

More compact—more practical in control and installation than separate weighing units. Write for special literature on Koehring Weigh Mix.

SIZES

Pavers — 27-E six cylinder Waukesha engine, automatic operations. 13-E four cylinder Waukesha engine. Comply with A. G. C. standards.

Subgrade Planers — Built for all types of roadway, 8' to 27' widths; attachable to 27-E Paver.

Construction Mixers— 14-S, 21-S, 28-S. Trucks or skids; rubber tires optional. 28-S skids only. Weigh Mix attachments on 14-S. Comply with A. G. C. standards.

Dandie Mixers—5-S, 7-S, 10-S. 5-S single or four cylinder, 7-S two or four cylinder, 10-S four cylinder gasoline engine. Charging skip or low charging hopper and platform. Rubber tired or steel rimmed wheels. Comply with A. G. C. standards.

Division of National Equipment Corporation

KOEHRING COMPANY MILWAUKEE, WISCONSIN

PAVERS, MIXERS—GASOLINE SHOVELS, PULL SHOVELS, CRANES AND DRAGLINES

Sales Offices and Service Warehouses in all principal cities

Foreign Department, Room 579, 50 Church Street, New York City

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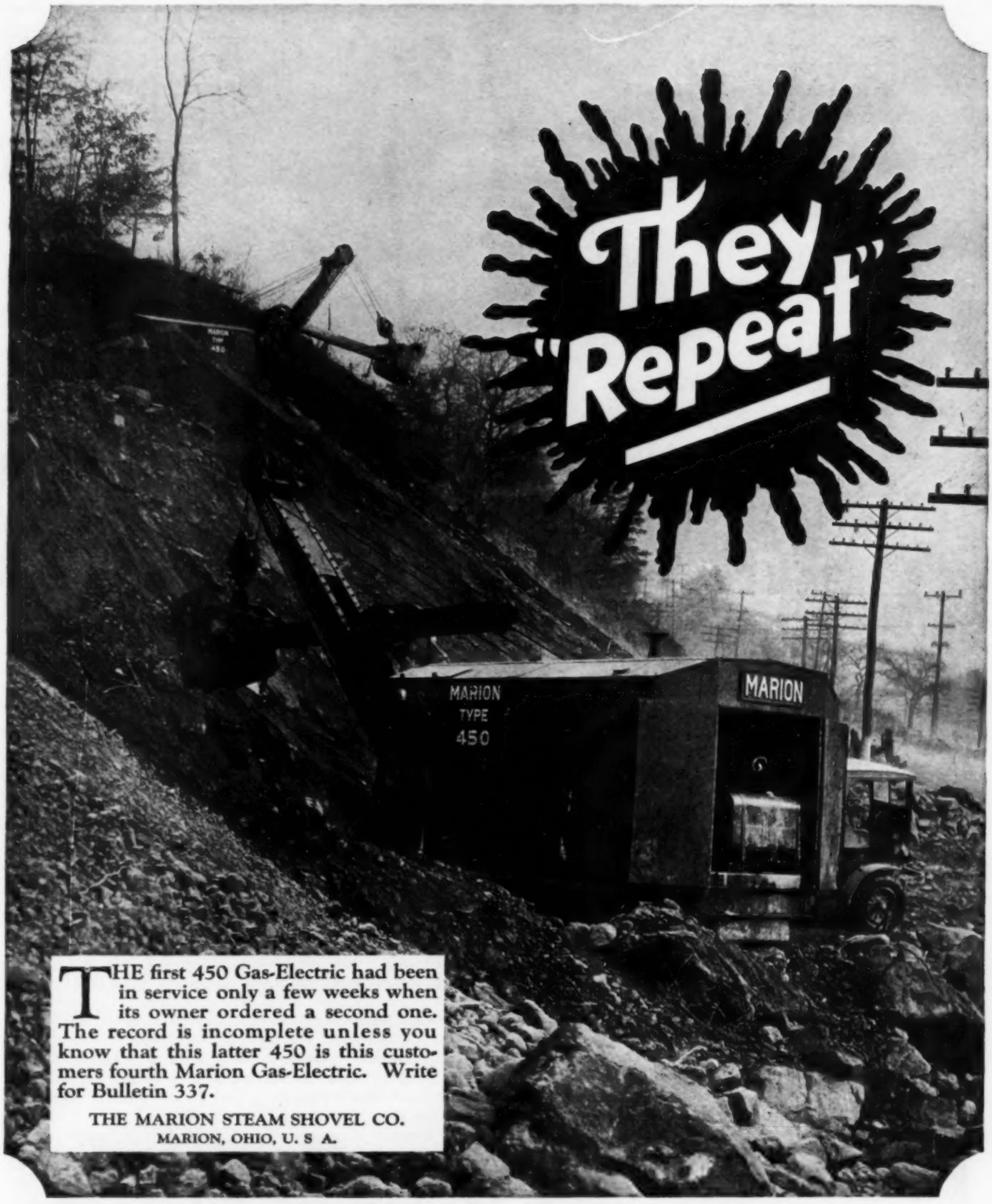
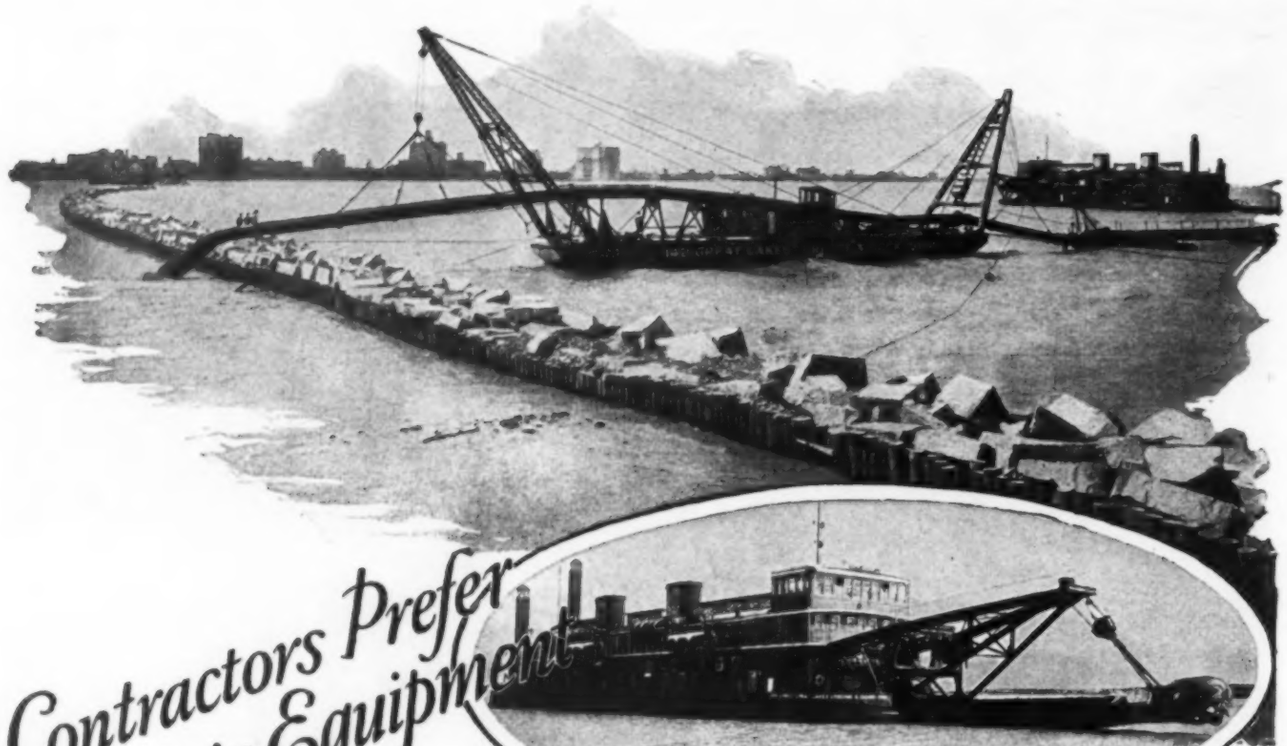


THE first 450 Gas-Electric had been in service only a few weeks when its owner ordered a second one. The record is incomplete unless you know that this latter 450 is this customers fourth Marion Gas-Electric. Write for Bulletin 337.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S A.

MARION

29088



Contractors Prefer Electric Equipment

These reasons were given by representative contractors, queried in a nation-wide survey:

- Economy
- Few repairs
- Low upkeep
- High salvage value
- Dependability
- Best for cold-weather work
- Breakdowns minimized
- No smoke or soot
- No handling of fuel or ashes
- Reduced fire hazard
- Convenience
- Ease of handling and operating
- Compactness
- Flexibility
- Noiseless
- No feed water lines.

In the operation of DREDGES

The Bucyrus-Erie Diesel-electric dredge *New Jersey*, the largest and most powerful ever built, is being used to build out the lake front at Chicago. This dredge is completely equipped by General Electric.

The Great Lakes Dredge and Dock Co. is one of many nationally known contractors who not only employ electricity on their projects but utilize it most effectively through G-E Motorized Power.

—and other contractors say:

"For portable gravel screening and crushing plants for road work we use electric power principally for the ease and quick starting of the several units of the complete plants. Late in summer, fall and spring, other power units were hard to start, usually requiring 30 minutes of each day to have the complete plant in operation. We found power costs less for electric motors."

—F.C. Dreher, Construction Co., Denver, Colo.

GE Motorized Power
—fitted to every need

200-291

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 9 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIES

for

Heavy Timber Construction

There's just one way to tighten or loosen lag-screws—*pump* them loose or *pump* them home with Lowell Lag-Screw Wrenches.

Contractors who have used ordinary open end wenches and Lowell Lag-Screw Wrenches are strong for the Lowell reversible ratchet movement. Pumping is far quicker and easier than stopping to refit. The one is a steady movement; the other a series of constant interruptions.

Over 50 years' experience is a guarantee of careful design and best construction, but you are most interested in saving time and money on the job. Lowell Wrenches will do just this. That's why we say, "Send for complete catalog illustrating the many types and sizes." Big special wrenches for special needs.

Send for Catalog R

LOWELL REVERSIBLE RATCHET WRENCHES

Lowell Wrench Company
Worcester, Mass.

DIETZ LANTERNS

LITTLE GIANT

COLD BLAST LANTERN

Burns 70 Hours Without Refilling

USE RED
No other color means
DANGER

DIETZ Lanterns assure **safety at lowest cost.** That is why Dietz Lantern Lights dot the uptorn highways of America after nightfall.

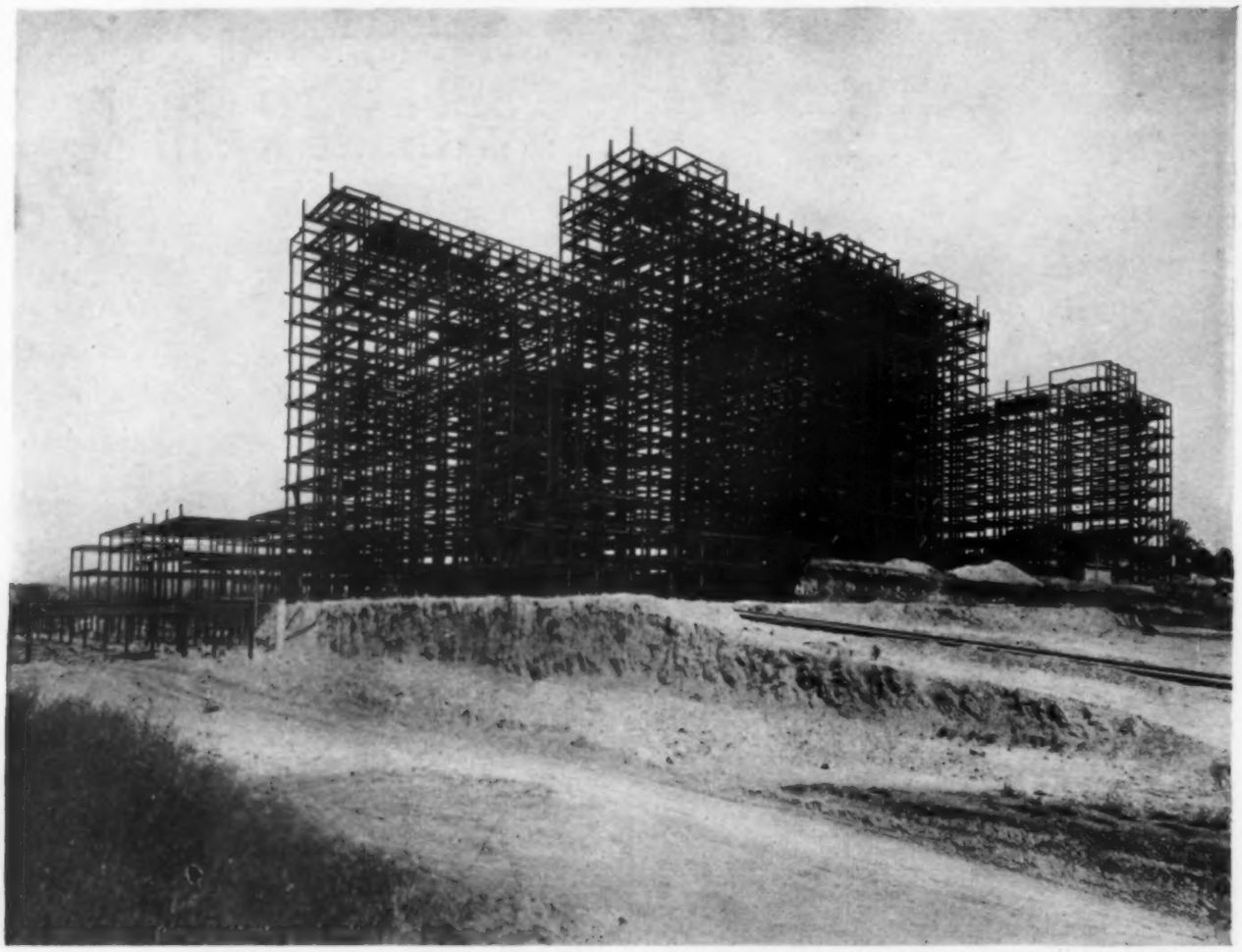
Among various Dietz Lanterns suitable for use by Contractors, Cold Blast "Little Giants" possess outstanding merit and usefulness. They are small—shed a generous light—and **burn over a week-end without attention.**

R. E. DIETZ COMPANY
NEW YORK

Largest Makers of Lanterns in the World

FOUNDED 1840

STRUCTURAL STEEL CREATED THE SKYSCRAPER



STEEL brings immediate, continued economies

BUILD with structural steel and savings begin at once . . . in less time, less labor and less material required. Steel so speeds construction that a steel structure is in service often weeks earlier.

Not only is steel so quickly and readily adapted to its use but it is so strong that less bulk of it is required than of any other material. Steel can be handled readily . . . very quickly moved into place. It occupies less space and provides larger interiors. Steel minimizes the human element in building . . . it is proved right at the mills . . . it comes to the job ready to go into place fully prepared to do its duty, *at once.*

You can build, alter, extend, remodel or remove a steel building more quickly than any other type of fire-resistive building—again a saving. Whatever type of structure steel is used for—building, bridge or residence—it brings not only permanent strength and security—but immediate and continued economies.

A Technical Service Bureau is at the disposal of architects, engineers, owners and others who have need of any information which can be supplied through the American Institute of Steel Construction, Inc.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

The co-operative non-profit service organization of the structural steel industry of the United States and Canada. Correspondence is invited. 200 Madison Avenue, New York City. District offices in New York, Worcester, Philadelphia, Birmingham, Cleveland, Chicago, Milwaukee, St. Louis, Topeka, Dallas and San Francisco.

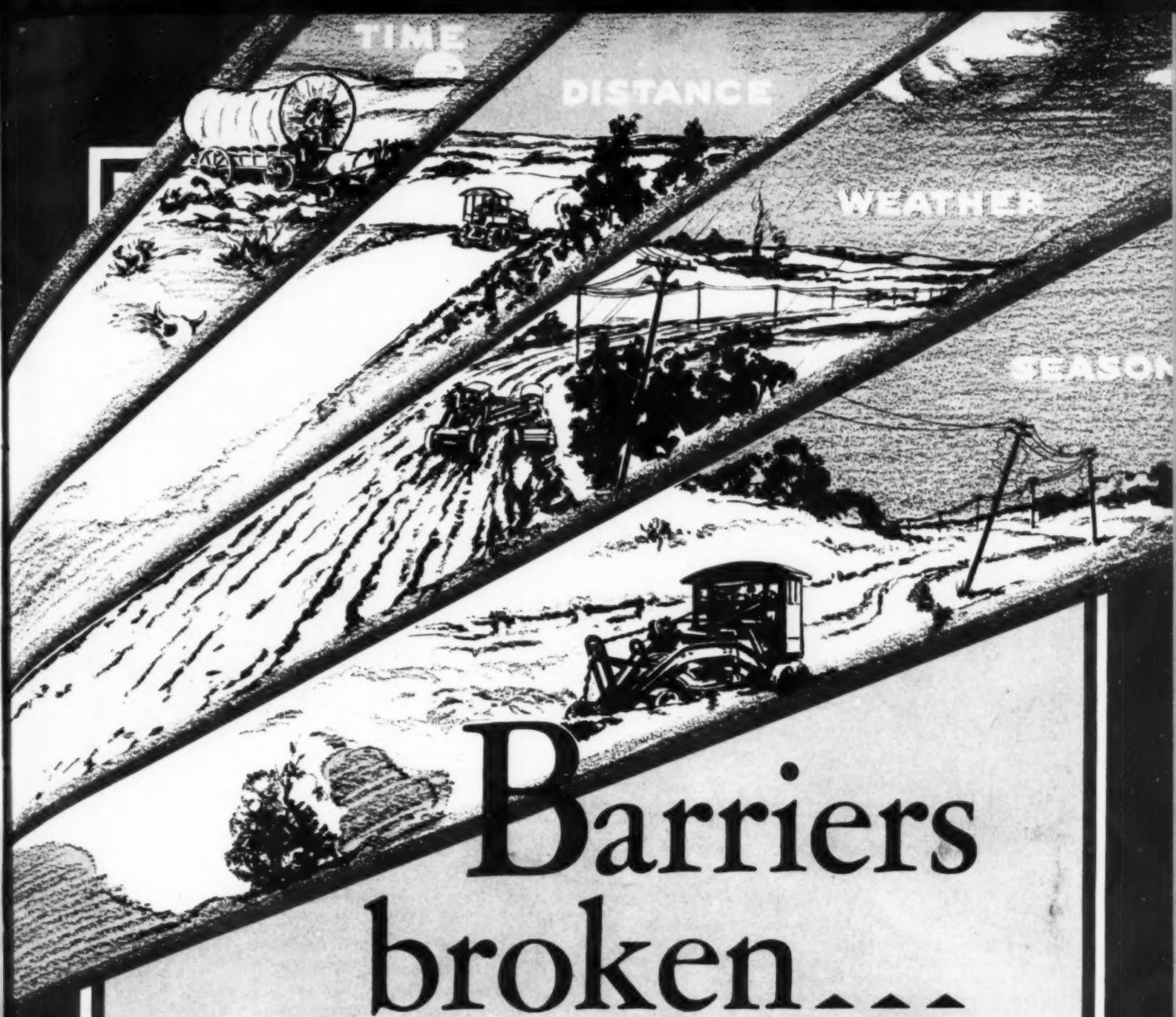
The Institute publishes twelve booklets,

STEEL

INSURES STRENGTH

AND SECURITY

one on practically every type of steel structure, and provides also in one volume, "The Standard Specification for Structural Steel for Buildings," "The Standard Specification for Fire-proofing Structural Steel Buildings," and "The Code of Standard Practice." Any or all of these may be had without charge, simply by addressing the Institute at any of its offices.



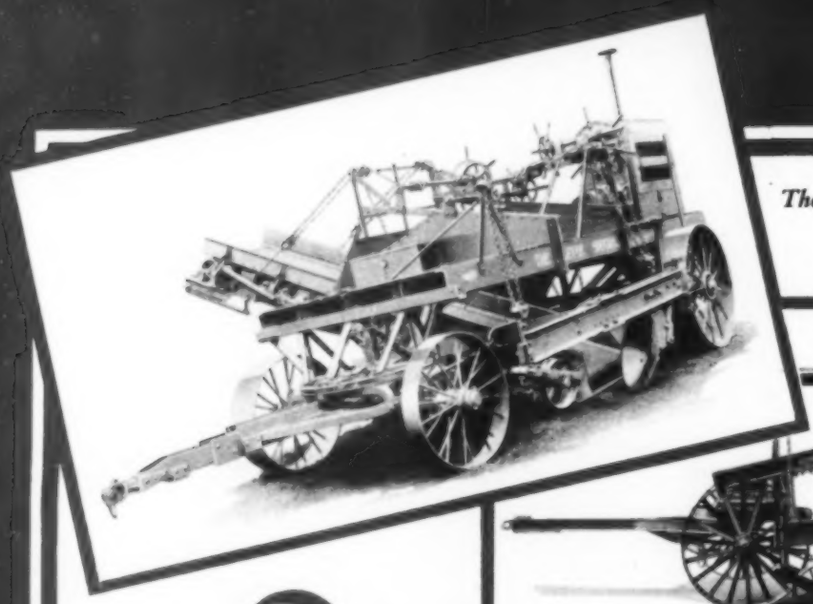
Barriers broken...

Time and distance . . . season and weather. . . . such have been the barriers of transportation. Pioneer builders of American roads used equipment bearing our name, to break down the barriers of distance and time.

More recently we have set ourselves to overcome the barriers of season and weather. We have designed equipment with year 'round uses . . . equipment that operates under conditions of weather and soil that would halt or lower the efficiency of most machines. We have succeeded largely because every machine we manufacture is designed and built to meet and overcome definite road construction or maintenance problems.

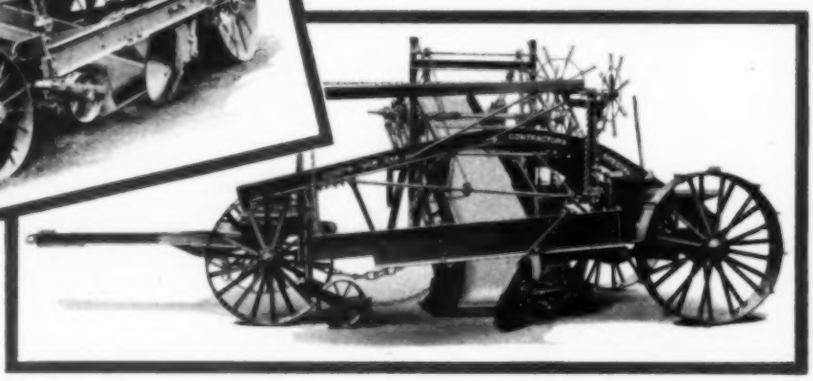
With these barriers broken, Austin-Western Road Machinery performs a modern service to contractors and public officials and continues an old tradition. Wider usefulness at a minimum investment means better roads and improved transportation.

Austin-Western
ROAD MACHINERY



The Western Levee Special Elevating Grader

The Austin Contractor's Special Elevating Grader



2 good *"reasons why"* there's money in earth moving

With either of these elevating graders you can trim your earth moving costs as you've never trimmed them before. You can "skin" your estimates and still make money—especially if you use Western Crawler Dump Wagons along with the graders.

The Western Levee Special Elevating Grader

There are a number of new features on the Levee Special. The most outstanding is the 4-cylinder engine to drive the belt which is mounted on an extension platform back of the rear axle within easy reach of the operator. This motor drive on the belt increases the capacity of the machine from 40 to 75 per cent, depending on soil conditions. It also relieves the tractor of the load required to elevate the dirt.

The 42-inch belt has a 40-inch clearance between side boards. The new tongue used on the Levee Special pulls directly on the plow and king-pin. The frame has been increased in strength and weight.

Western Crawler Dump Wagons

These crawler wagons come in 5, 7 and 10-yard sizes. With their broad Athey Truss Wheels they are invaluable to the earth moving contractor in combination with elevating graders or power shovels

The Austin Contractor's Special Elevating Grader

The Contractor's Special is a modern machine if there ever was one! In it, superb engineering has accomplished the almost impossible. Maximum strength and capacity are provided. At the same time, though weight enough has been used, a glance at the machine shows you the economy of design that has been rigidly maintained. Only essentials have been used, but they do the work of many times their weight in bulky construction and bracing—and add greatly to the life of the grader.

Special features include—a spring mounted front platform—extra strong wheels with flat spokes and removable sleeves—and an improved rear axle and clutch mechanism.

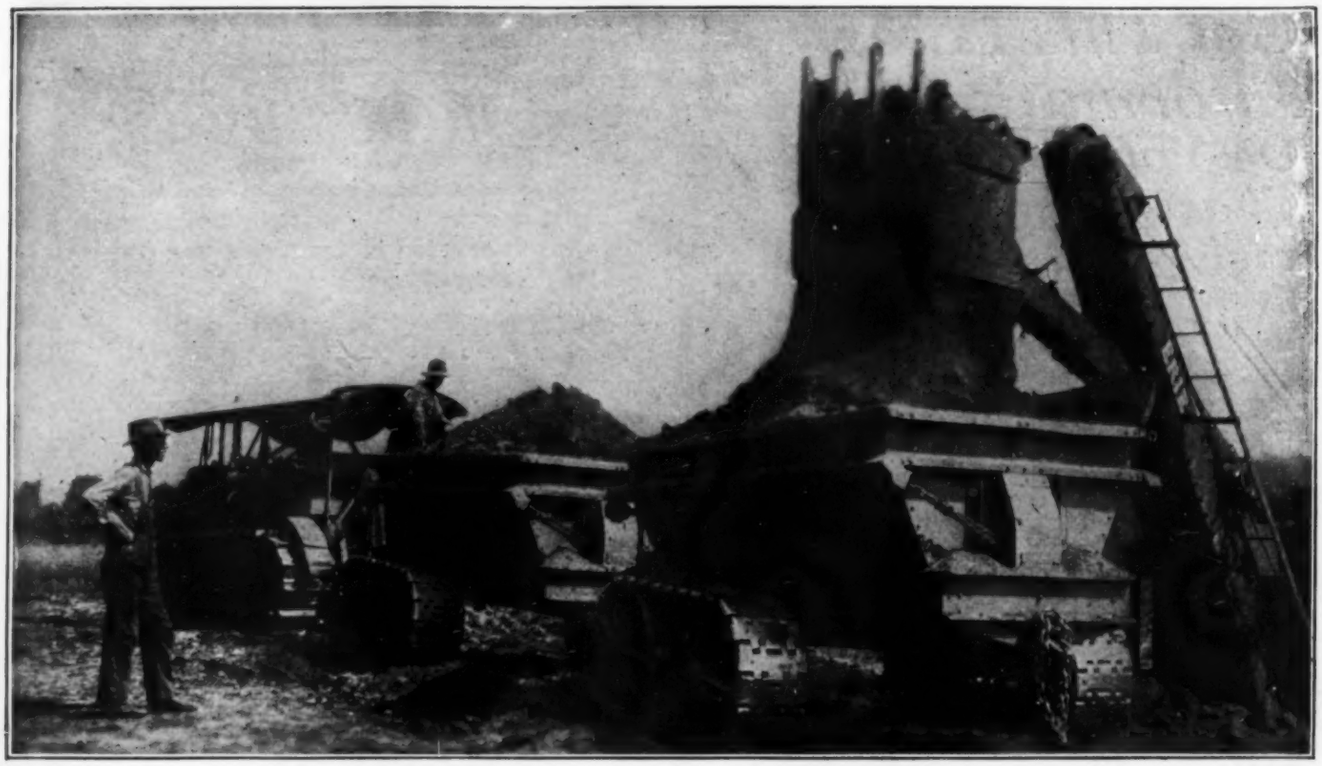
The Contractor's Special can also be fitted with the Austin Power Take-Off which takes the power for driving the elevator directly from the tractor engine. With this additional equipment it is possible to operate under soft or wet conditions when rear-wheel-drive graders would be useless.

Write for complete information

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue, CHICAGO, ILLINOIS—Branches in principal cities

Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers



Western Crawler Dump Wagons, Direct Hitch, Building Roads in Minnesota

How Can You Compete ?

"We consider that our four direct-hitch Western Crawler wagons do the work of 30 1½-yard wagons," said Herbert Griffis of Griffis Brothers Construction Company, who are building a highway in Minnesota.

If you are not using Western Crawler wagons, how are you going to compete with such outfits, that can work night and day, can pull big loads where other type of wagons could not move, and operate in trains of two where hauling conditions are good?

Western Crawler dump wagons are made in three sizes, with direct hitch or front trucks. Send for our Bulletin 29-AD that gives full information.

Western Wheeled Scraper Company
Aurora, Illinois, U. S. A.

WESTERN

Western

DUMP CARS AND GRADING EQUIPMENT

Get This Latest Information On Your Chosen Field

Informative
Authoritative
Interesting

PACKED within the pages of this handy treatise is complete usable information on the latest and approved method of curing concrete streets and roads.

Curing Concrete Highways contains just the kind of material every wide-awake road man needs to keep abreast of the times. Shows how to save time, trouble and money on highway jobs. A complete non-technical discussion of modern methods, illustrated with photographs of actual construction.

This valuable handbook sent with our compliments. Write for your copy today—the coupon below is for your convenience.

THE GRASSELLI CHEMICAL CO.
Incorporated
Founded 1839 Cleveland, Ohio
Branches in 19 cities

The Grasselli Chemical Co.,
Guardian Bldg., Cleveland, O.

Please send me, without obligation, a copy of **Curing Concrete Highways.**

Name .....

Address .....

City and State.....

GRASSELLI GRADE
A Standard Held High for 90 Years

ACCEPT NO SUBSTITUTE

Sterling

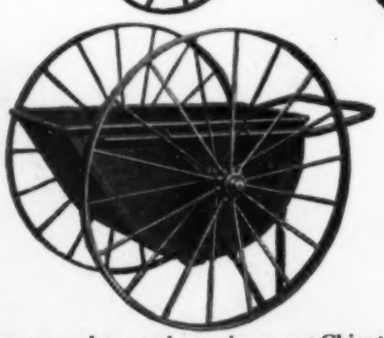
—"perfect balance"—the load is carried *over the wheel* not on the arms—thus more loads per man per day—less tiring effort.

No. 6A—A.G.C. for dry material. Capacity 3½ cu.ft. *All Sterling barrows have reinforced tray tops and corners.* This is the most popular general type barrow.

No. 31—large concrete or wet material. Capacity 4 cu.ft. struck. *The easiest wheeling big load barrow made.* Will outlast others in toughest work.

No. 10A—wide tray, capacity, 4½ cu.ft. A.G.C. standard. Fits all contracting requirements and *built to give the longest service.* Solid and strong.

No. 61—extra narrow deep tray, capacity 3½ cu.ft. for concrete, mortar, etc. A type that will cost you *less to use* because it will last longer.

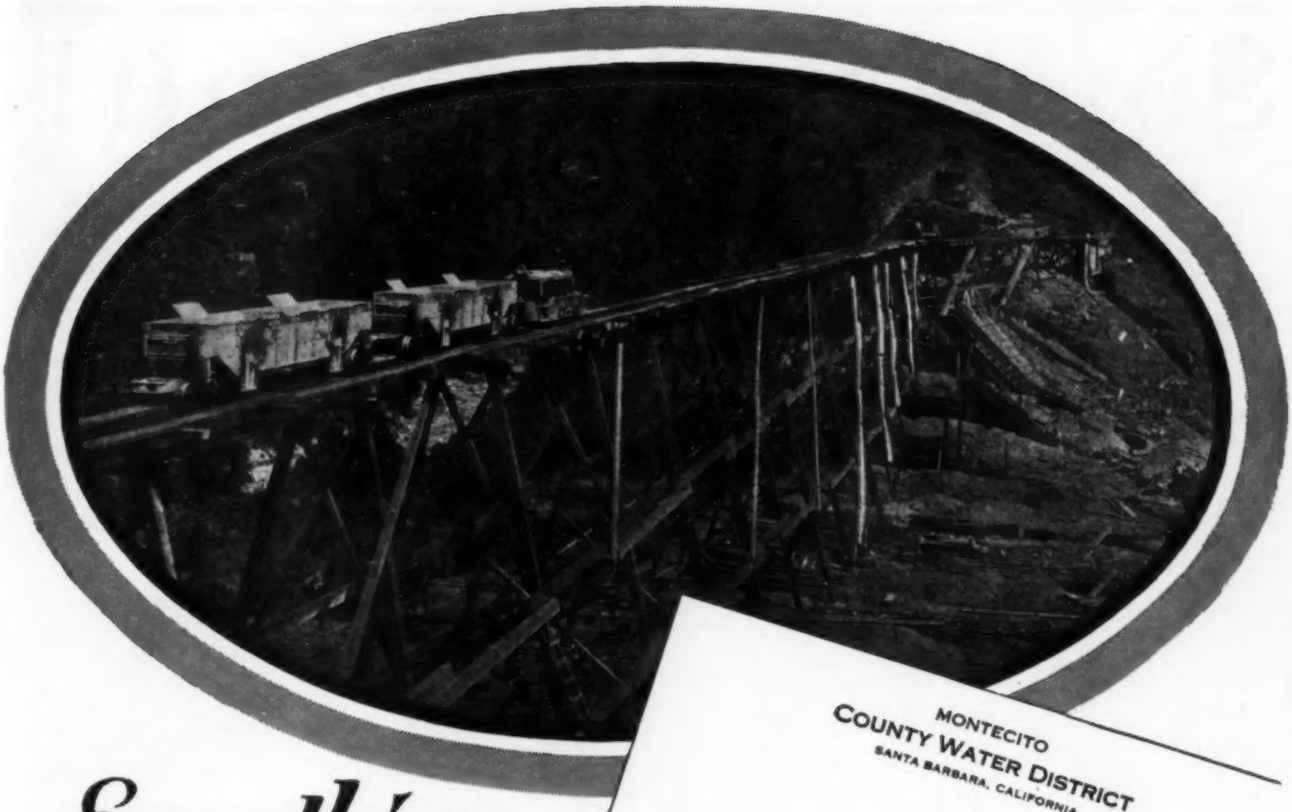


No. 6—the *strongest built cart* on the market. Full capacity body, no axle inside. Capacity 6 cu.ft. or 1200 lbs. Perfect balance and easiest wheeling. 42-in. wheels.

The above is but a few of the many, many Sterling types — write for complete catalog. Buy by Sterling name — leading hardware and equipment dealers have them or they can get them quickly from our complete stock warehouses at Chicago, New York, Philadelphia Pittsburgh, Cleveland, Detroit, St. Louis.

Manufactured for the European Markets by Sterling Foundry Specialties, Ltd., Sterling Works, Bedford, England

STERLING WHEELBARROW COMPANY
(STERLING OR A WHEELBARROW MEANS MORE THAN STERLING OR SILVER)
Milwaukee Wisconsin



Everything DEPENDED UPON TRANSPORTATION *so they ordered* PLYMOUTHS

GASOLINE PLYMOUTH LOCOMOTIVES DIESEL

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Co.
299 Riggs Ave.,
PLYMOUTH, OHIO

MONTECITO
COUNTY WATER DISTRICT
SANTA BARBARA, CALIFORNIA

August 20, 1929

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Dear Sirs:

The Montecito County Water District has purchased Five--Four Ton Plymouth Locomotives from you at different times and they are all in use at the present time on our construction work.

We are constructing two dams on the Santa Ynez river north of Carpinteria under rather unusual conditions as all supplies and material have to be transported through a two mile tunnel, down an incline, up a three mile railroad with a 6% grade and through another 1000 ft. tunnel to the work. Naturally under these conditions we are absolutely dependent on our transportation system.

We are very well pleased with the performance of the Plymouth Locomotives. We are hauling ten tons up a 6% grade and our hauling costs are very reasonable.

I feel that our choice of locomotives was a happy one and under similar conditions would specify Plymouth Locomotive again.

Very truly,
Earl Grant
Resident Engineer.

CW/as

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Some Scraper-full!!

Rocks—boulders—stumps—they all come up without rooting or scarifying when you use the

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ORIGINAL AUTOMATIC

TRACTOR SCRAPER

Invented and patented in 1919—and developed and perfected by 10 years' actual construction work.

Does its own digging—needs no auxiliary equipment to help out.

In brief, more yardage per h.p.

STRONG. Stands up to hard work, regardless of size tractor used. Lever and hydraulically operated. All steel, riveted and welded. Operated by tractor-driver.

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And then, no matter where you move to all that *Construction Methods* needs is your old and new address.

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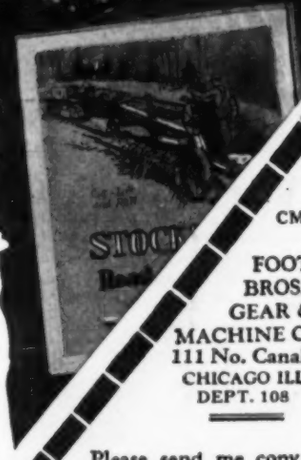
Make Gravity Work for you

ON side grades like this, Stockland low center of gravity design holds the blade true to the road and insures a full capacity cut.

This is only one of the many Stockland features which contributes to the unusual dirt moving capacity of all Stockland Graders.

Write for the Stockland Grader Book—chuck full of data, diagrams, and information you will be interested in.



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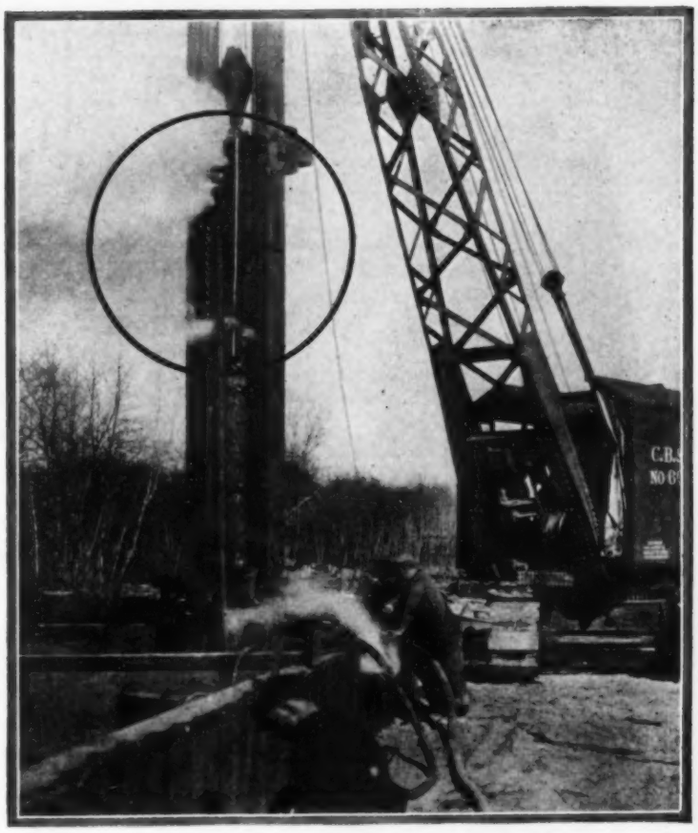
—ICE 8" thick
in the cofferdams

When the C. B. & Q. R.R. wanted to drive several hundred 30-ft. timber piles to 20-ft. penetration in open cofferdams for bridge pier construction in grade revision work near Alma, W. S., they selected a



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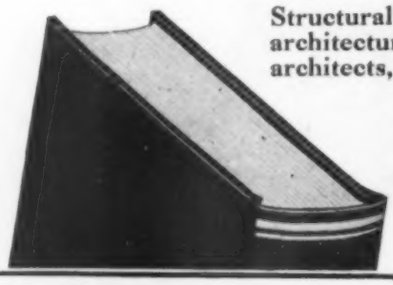

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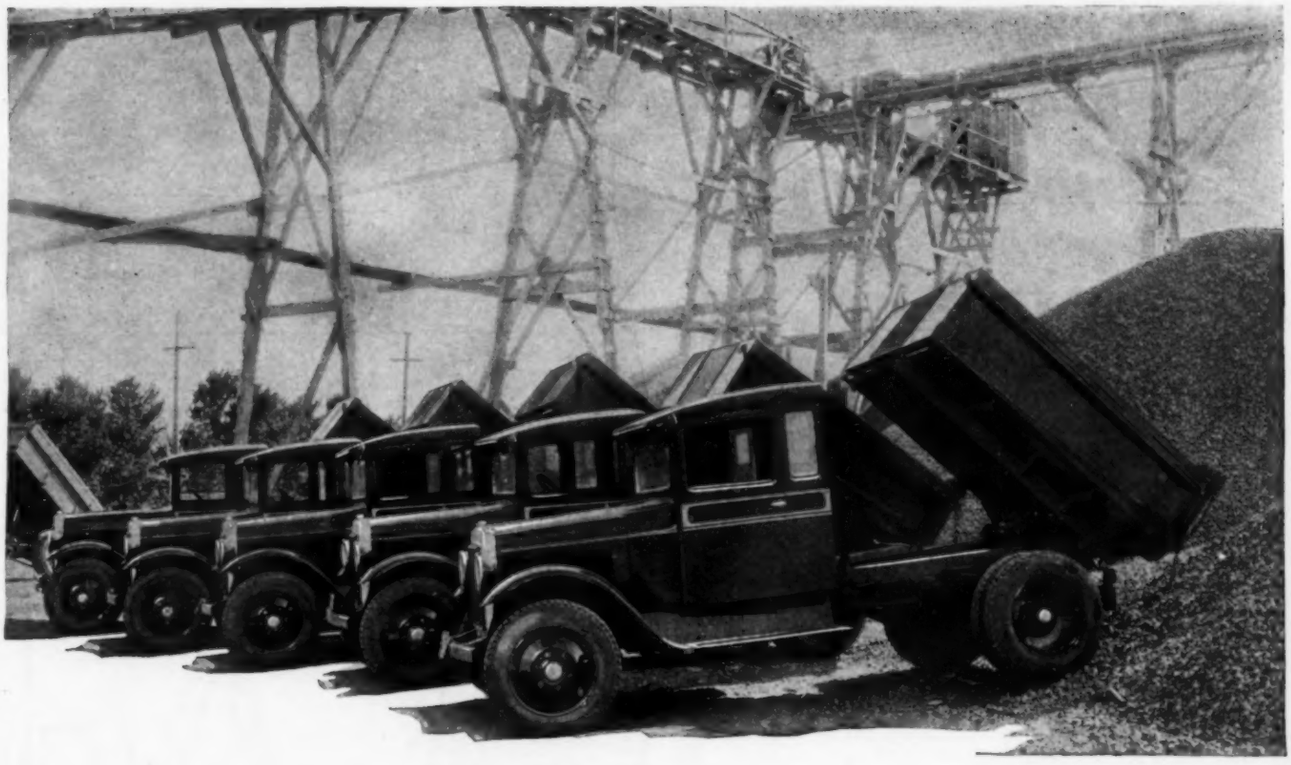

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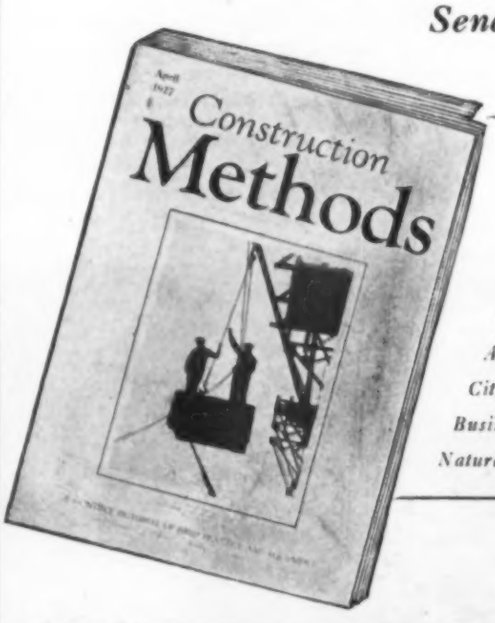

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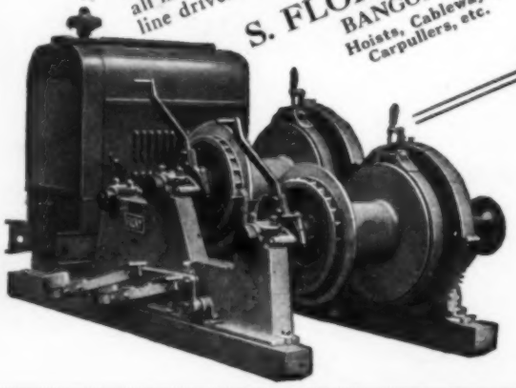

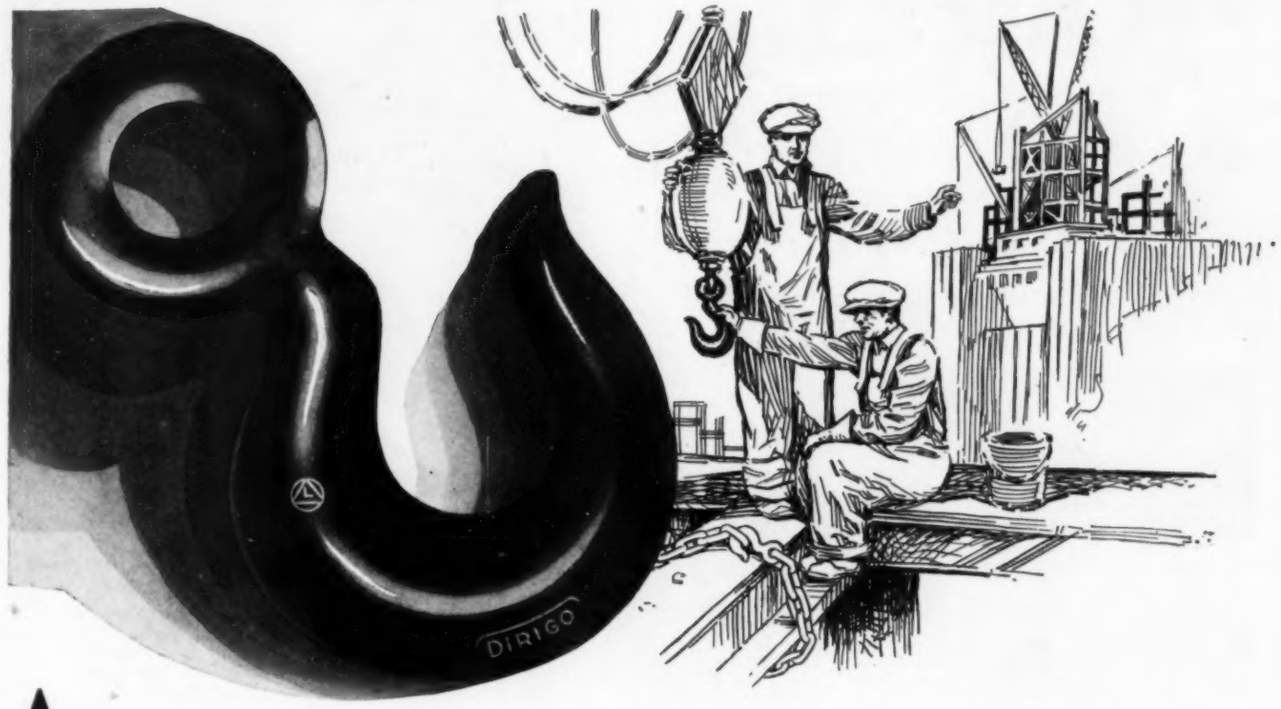

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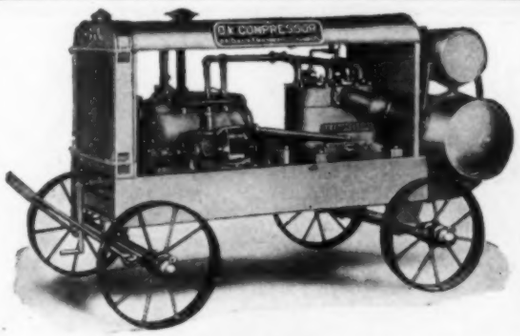

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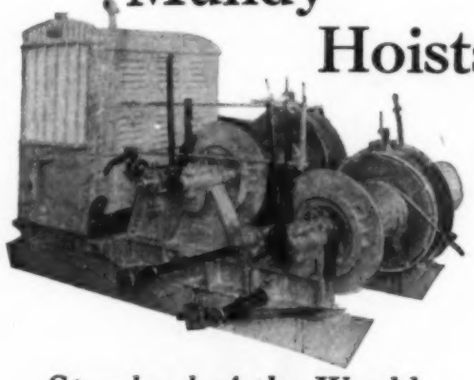

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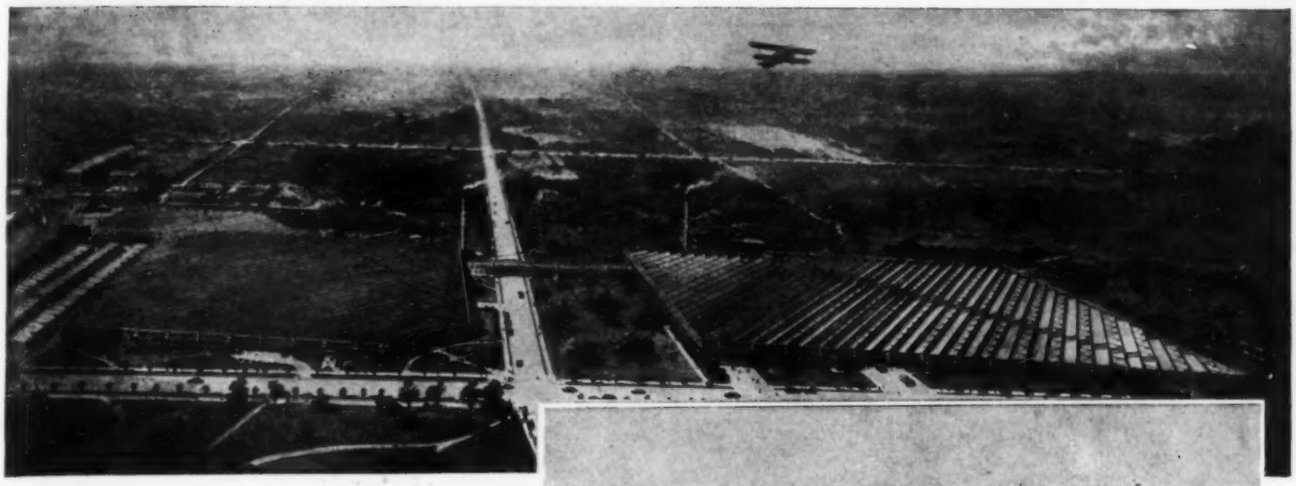

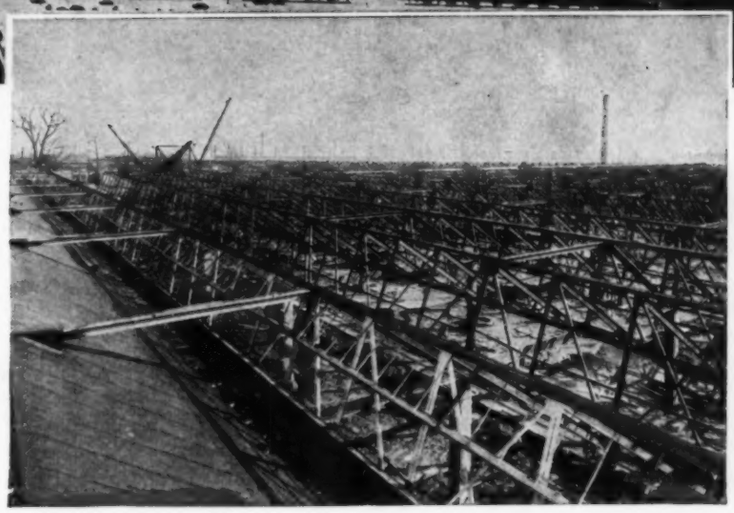

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ATWATER KENT MANUFACTURING COMPANY PLANT

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Philadelphia now has the largest radio manufacturing plant in the world. The Atwater Kent Manufacturing Company's plant, with its new addition, covers over 30 acres of floor space. Both buildings are of the sawtooth skylight type, providing wide unobstructed floor area with uniform daylight illumination. The new addition alone covers more than 16 acres. Carnegie Beams were used in its construction.

Neatness of construction and simplicity of detail characterize jobs fabricated of Carnegie Beams. Their parallel flanges provide eight surfaces for connections instead of four, simplifying very markedly the great variety of connections usually required in industrial buildings. For long, heavily loaded spans, a complete range of beams of high section modulus is offered which reduce obstructive columns to a minimum; and for long, unbraced column lengths there are included in the series sections designed to give a maximum least-radius-of-gyration combined with minimum weight.

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Subsidiary of United States Steel Corporation

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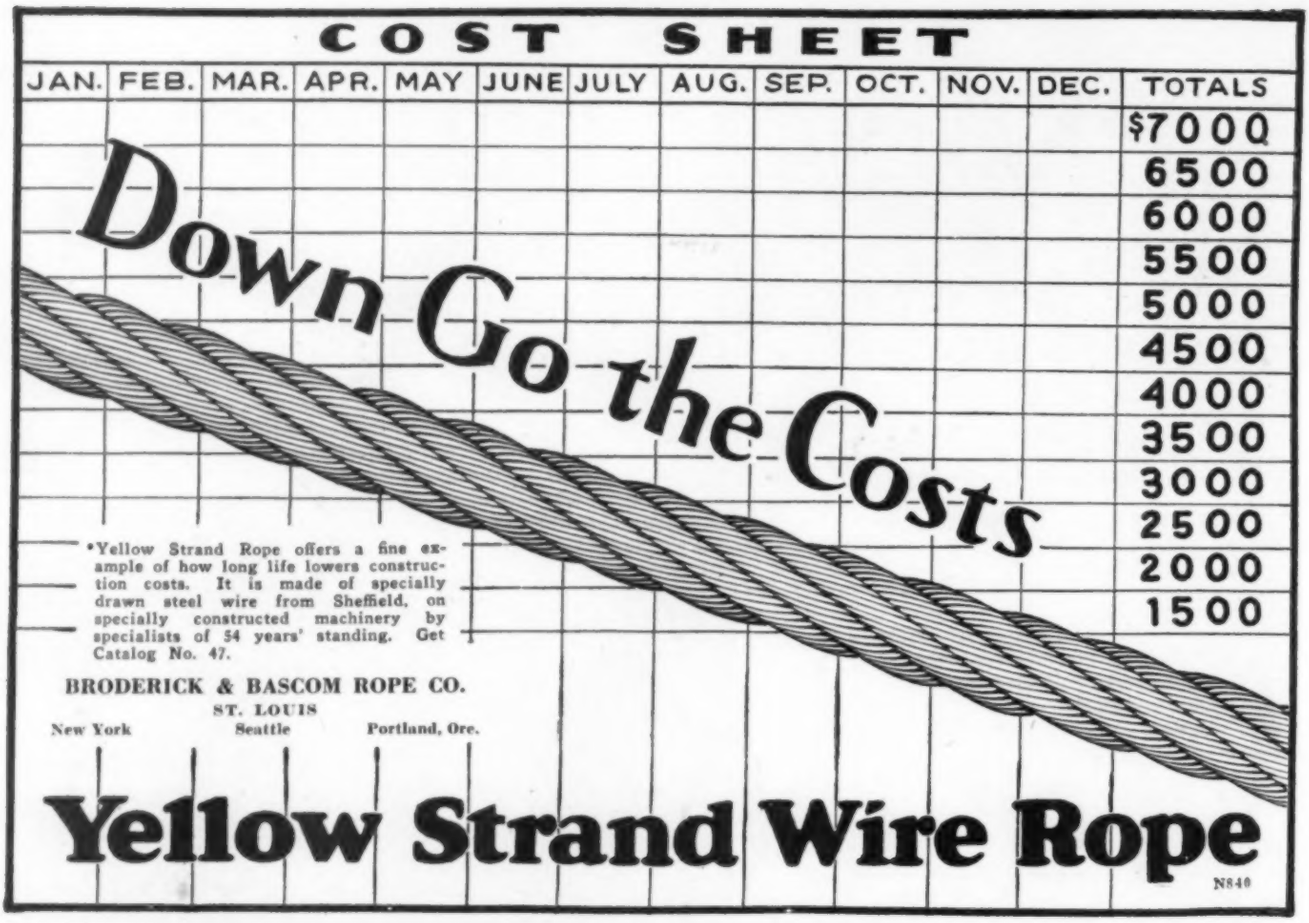
CARNEGIE BEAMS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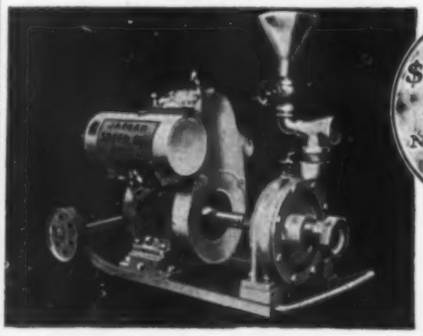
8000 Gallon . . . . One Man Portable Pump



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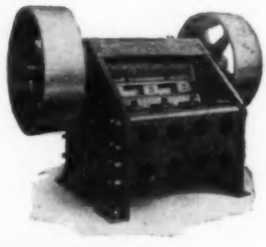

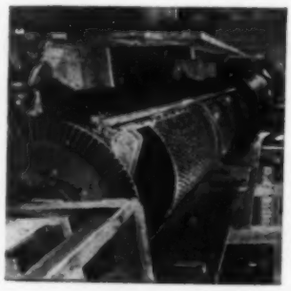

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The flash-flash of the Eveready Portable Flasher flicks through the murkiest nights

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In automobile tow-cars or construction trucks it is invaluable for an emergency warning signal. Many state and county highway commissioners are instructing all their trucks and road gangs to carry an Eveready Portable Flasher to be prepared for all emergencies. Public utility companies find them sure and easily transferred for temporary warning lights.

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The Eveready Portable Flasher requires no daily inspection. It operates automatically. Maintenance costs are low. It is made of heavy metal and will last for years. It is safe and eliminates fire hazards! Sold through National Carbon Company's distributors.

For construction work

As a traffic warning

SPECIFICATIONS — *Height 16 inches. Diameter of base 7 inches. Weight, including batteries, 16½ pounds. Requires four standard Eveready 6-inch Dry Cells connected in series to deliver 6 volts. Extra 6-volt lamp inside battery housing. Battery compartment constructed of seamless steel attractively finished in red. Top of flasher cadmium plated for weather protection. Heavy fresnel-type glass lens in red or other colors. Padlock for battery compartment with an extra-long hasp so that the device can be chained. This flasher is of rugged construction throughout and entirely weather-proof.*

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New York, N. Y.

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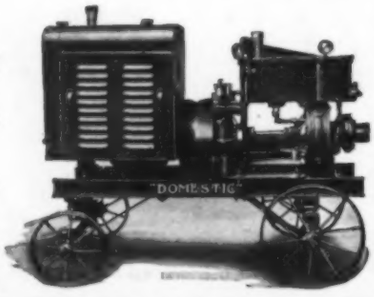
Unit of Union Carbide UCC *and Carbon Corporation*

EVEREADY
TRADE MARK
PORTABLE FLASHER
— dry battery operated

"DOMESTIC" AUTOMATIC PRIMING CENTRIFUGAL PUMPS



This Pump absolutely primes itself; and will draw water 27 feet vertical.

Is ideal for use on all types of de-watering jobs including Drainage Point Pre-Drainage, as shown in cut.

The positive high vacuum this Pump is able to create has, in many cases, enabled contractors to drain DRY, deep excavations where other suction type pumps have failed.

Automatic Control of vacuum producing action keeps the Pump primed whenever there is enough water to seal and fill the suction line. This is a valuable feature, as it not only gives large pumping possibilities but KEEPS the excavation DRY by taking care of seepage inflow.

In addition to these Automatic-Priming Centrifugal Pumps — the complete "Domestic" Pump line includes the "Giant" self-oiling and ball bearing equipped Triplex Road Pump, Diaphragm Pumps, Vertical Plunger Trench Pumps, Triplex and Sextuple Jetting Pumps, etc. — all Dependable Pumping Units and leaders in the Contractors' field.

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Therefore, when you install Lock-Bar Steel Pipe it is just as though you had installed an all-plate steel pipe. The joint will hold as long as the plate lasts. This is now an established fact.

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POWERFUL AND DEPENDABLE AS STEAM
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MADE IN FOUR SIZES

5-7-10-12 tons

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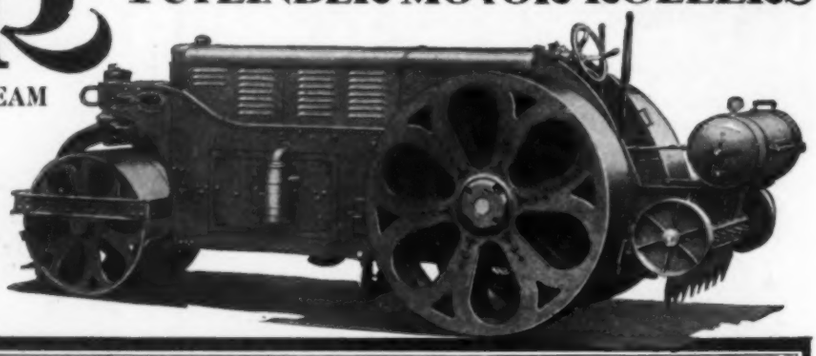

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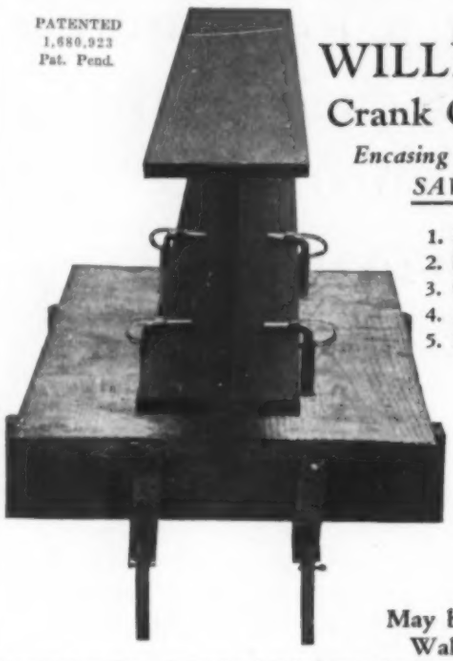

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SAVE

1. Shoring.
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May be used on Wall Forms

Assembled on floor—hoisted and locked into place by man on I-beam, who screws hook rods down and locks into place by snapping over spacer bar. Spacer bar holds hook rods to flange, gauges fire proofing and acts as reinforcing. Safe loading 3500 pounds. Holds entire falsework, spacer bar and hook rods together, less than 10c. Write for particulars. See July 4th issue, page 23.

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There's no need to turn good bolts into scrap if you use Cleveland Bolt Sleeves.

Bolt Sleeves

With Cleveland Bolt Sleeves, forms are removed more easily—full bolt salvage is possible — and a labor-consuming task becomes a one-man job.

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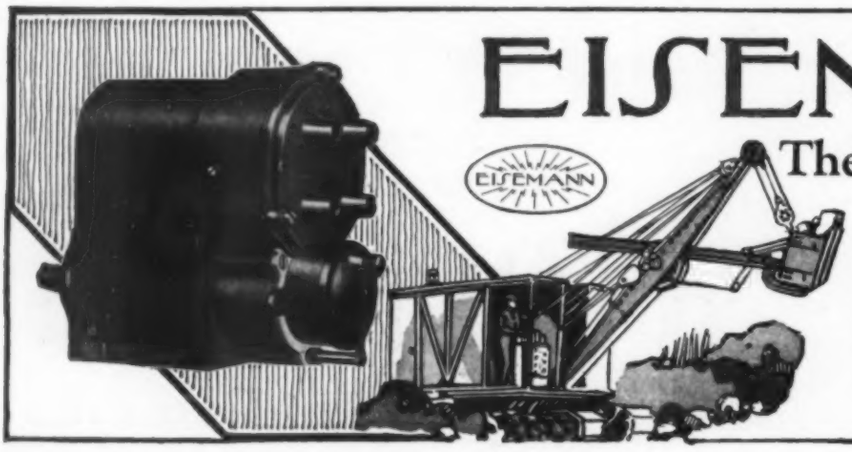
The Cleveland Container Co.
10135 Berea Road, Cleveland, Ohio
Manufacturers of Paper Tube Products for the Construction Industry



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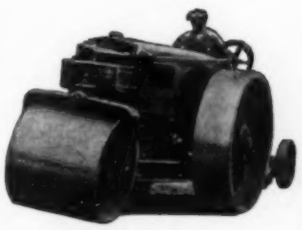
ABILITY to lead means the possession of those qualities that men recognize as superior. *Nothing else* makes leadership.

From coast to coast, wherever new roads are being made or present ones repaired, Buffalo-Springfield Road Rollers are the choice of the men on the job. Advanced design and superior performance make these rollers widely accepted as leaders worthy of the name.

Various steam and motor designs in all practical sizes. Attachments when desired. Interesting booklet on request.



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Built of Steel - ½ ton lighter, 50% stronger

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100% BALL BEARING

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the amount of labor required for the various building operations.

To furnish you—

with prices of labor and materials useful in checking estimates.

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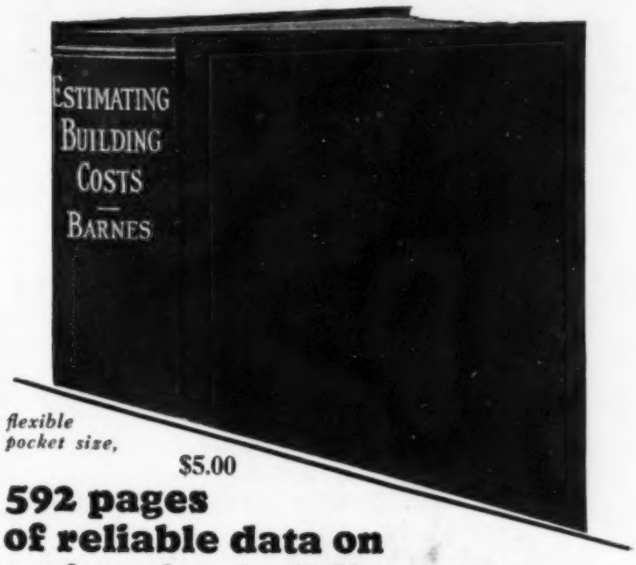
By FRANK R. BARNES

Building Valuation Engineer of the New York Central Lines.



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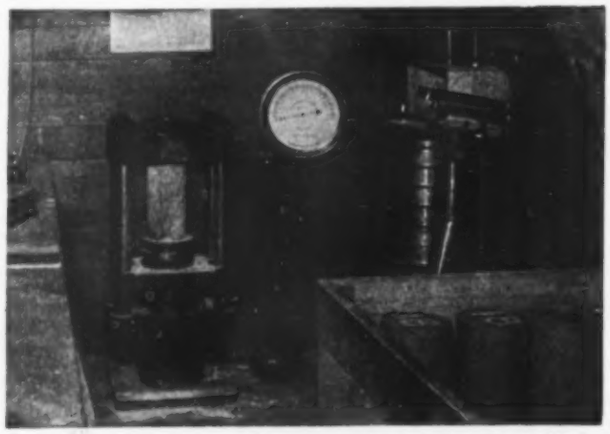

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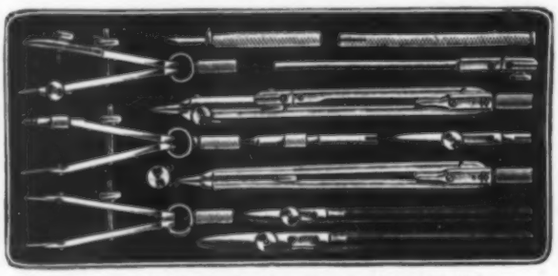

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KOLESH & CO.
138 Fulton St., NEW YORK

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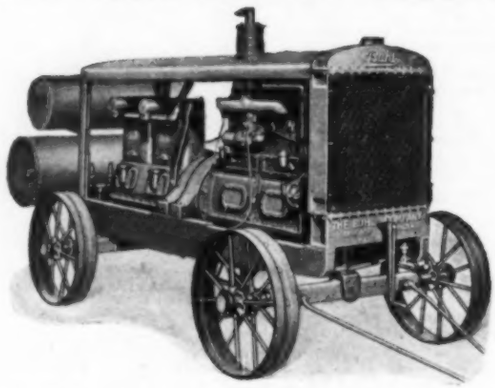

The Buhl Portable Compressor embodies the latest, up-to-the-minute improvements and consequently is able to produce compressed air more economically than any other compressor is able to do. Furthermore, the many advanced features of the Buhl result in greater *simplicity* of *operation, longer life* and *freedom* from *expensive shutdowns.*

Buhl Portable Compressors are obtainable in 36, 55, 90, 100, 110, 220 and 330 cubic feet capacities and with any mounting for portable use desired.

Descriptive bulletins on request.

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To
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Puller Co.,
Waltham, Mass.

Gentlemen:

Show me how gears and wheels can be pulled easily. Quote prices on Crane Pullers. No obligation.

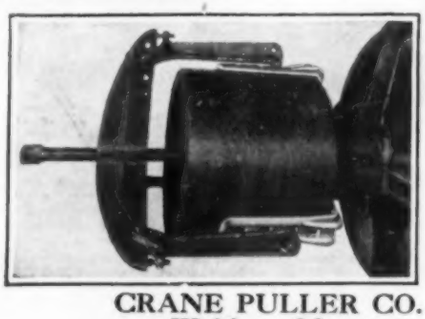
From .....

Address .....

In removing wide faced pulleys, silent chain drive sprockets, paper faced pulleys, etc., a longer arm with a deep wide jaw is required. This attachment is used as an extension to the regular arm. It does especially fine work in removing paper faced pulleys. It is shown (on the right) removing a 20-in. by 24-in. Paper pulley from a 200 H.P. Motor.

Truck wheels, winch drums, pulleys, gears, etc., are quickly pulled with this handy tool.

You can not stick it on the toughest job! Every power shovel, dump-truck, hoisting engine,—every paving mixer should be equipped with a Crane puller in its tool box!



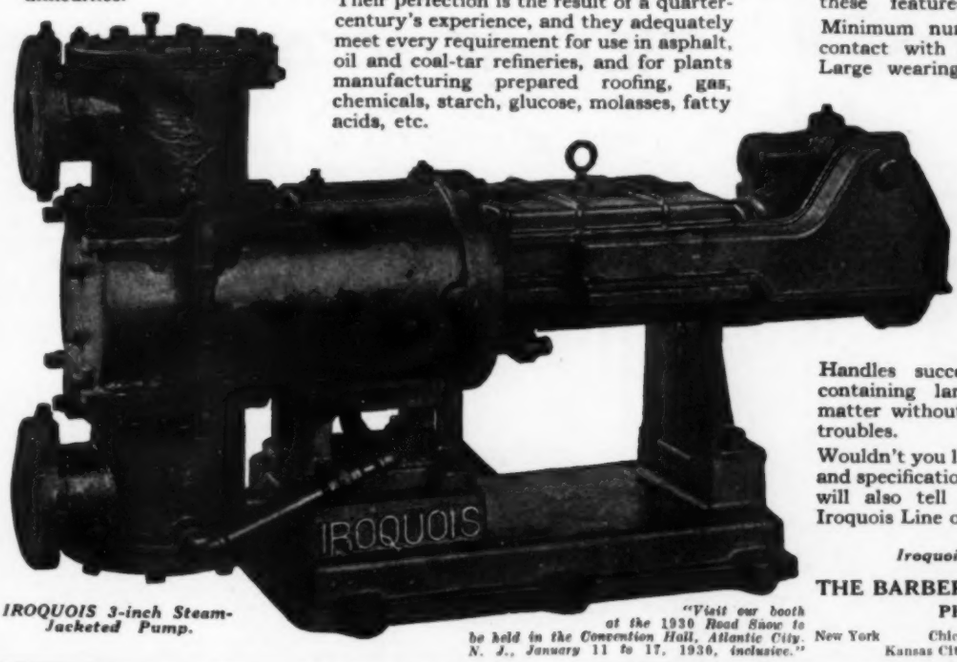
CRANE PULLER CO.
Waltham, Mass.

IROQUOIS Steam-Jacketed Pipe, Fittings and Pumps

for asphalt and other viscous materials

You know the trouble that is so frequently encountered in pumping asphalt and other viscous materials—they just won't flow at atmospheric temperatures. And you will be glad to know that Iroquois Steam-Jacketed Pipe, Fittings and Pumps are specially adapted to overcome such difficulties.

Their perfection is the result of a quarter-century's experience, and they adequately meet every requirement for use in asphalt, oil and coal-tar refineries, and for plants manufacturing prepared roofing, gas, chemicals, starch, glucose, molasses, fatty acids, etc.



IROQUOIS 3-inch Steam-Jacketed Pump.

Iroquois Steam-Jacketed Pipes have one pipe inside of another, the inner one being surrounded by steam, keeping hot the material which is to be pumped.

The Iroquois Steam-Jacketed Pump which is also a part of the Iroquois system has proved so highly efficient because of these features:

Minimum number of working parts in contact with material being pumped. Large wearing surfaces to reduce wear. Large, straight passages for liquid being pumped. Simplicity of construction insures low maintenance cost. Ease of operation with no skilled attention. Steam jackets cover all moving parts—pump can be started and stopped at will without cleaning it. Perfect accessibility of all wearing parts. No springs or small, easily broken parts in valve chambers. Handles successfully viscous material containing large quantities of foreign matter without undue wear or operating troubles.

Wouldn't you like to have full information and specifications? Write us today and we will also tell you about the complete Iroquois Line of road-building machinery.

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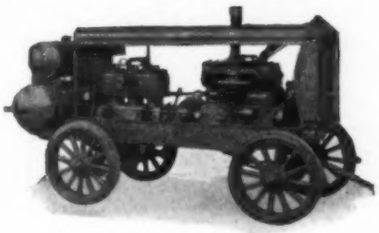

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$3,422.50 Savings in two months

for a building contractor (name on request) by using two WAPPAT Electric Handsaws for cutting risers, sills and form work.

They did the work of eight men with handsaws and effected a daily savings of $68.45 in labor costs. These modern labor saving tools will do the same for you.

Powerful, a motor designed and built for hard work—Durable, the entire construction and material used gives them long life—Safe, the patented telescoping safety guard protects operator and other workmen.

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INCORPORATED
Division of
SIMONDS SAW & STEEL CO.
44 No. Braddock Ave.
Pittsburgh, Pa.

Name .....
Address .....
City .....

HUMDINGER PUMPS

Non-clogging, everlasting rubber ball valves, totally enclosed, running-in-oil jacks, bronze bushed bearings, all steel trucks, and enclosed engine crank cases make HUMDINGER PUMPS.

THE CONTRACTOR'S CHOICE

Full detail description given in Bulletin No. 1034 CM. Send for a copy.

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Factory: Hackensack, N. J.

TOLEDO TORCHES

The harder it blows the better they burn

Toledo Torches have established a reputation . . . for dependable performance at low cost, that is unequalled by any other safety light made.

Sold by equipment dealers everywhere!

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Toledo Pressed Steel Company
Toledo · Ohio

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Will your highways be full of tracks in the snow this winter, or will they be kept clean and open to traffic? It's none too soon to think of snow fighting equipment.

Why not get a WARCO grader with snow plow attachment? It will give splendid service winter and summer. Equipment idle half the time earns no profit.

W. A. RIDDELL COMPANY

BUCYRUS OHIO

Graders, Rollers, Wheeled Scoops, Rear Crawlers

A Long Time Wearing Out

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536-40 W. Federal St.,
Youngstown, Ohio.

Send me information on Sabin Gloves.

Name .....

Address .....

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If you wish a pair of No. 108 Gloves, enclose $1.35 and check here ☐.

The quality is built right into Sabin's gloves. They're made for punishment, and live long under it.

No. 108 represents the most glove for a $1.35 that you'll ever meet. Your hands will like their comfortable feel—and they'll never slip off, thanks to the holdtight back.

Grey Buffed Cowhide hand, heavy canton flannel back, six inch canvas cuff and protected sides and fingers.

A $1.35 brings you a pair.

Use the Coupon.

SABIN CO.—Gloves
536-40 W. Federal St., Youngstown, Ohio

No. 108

Who's Getting the Big Contracts?

A Monthly Guide to Where the Construction Dollar is Being Spent

Far West

Los Angeles, Calif.
Tunnel: $536,930
J. G. Donovan & Son, 4031 Goodwin Ave.

Lynwood, Calif.
Paving: $502,250
G. H. Oswald, Los Angeles.

Oakland, Calif.
Pier: $825,000
Schuler & McDonald, 1723 Webster St.

Sacramento, Calif.
Bridge: $209,377
Lord & Bishop, Oroville.

Stockton, Calif.
Cement Plant: $1,400,000
MacDonald Engr. Co., San Francisco.

Portland, Ore.
Bridge: $1,026,897
Gilpin Constr. Co., Worcester Bldg.
Wallace Bridge & Structural Steel Co., Seattle, Wash.

Everett, Wash.
Water Tunnel: $1,000,000
Coyle Constr. Co., Seattle.
Rumsey & Jordan, Seattle.
Coluccio & Areorace, Seattle.

West of Mississippi

Lamar, Colo.
Waterworks: $236,380
Hayner & Burns, Las Cruces, N. M.

Duluth, Minn.
Grain Elevator: $300,000
Fegles Constr. Co., Ltd., Minneapolis.

Omaha, Neb.
Passenger Station: $700,000
V. R. Gould, City Nat'l Bank Bldg.

Childress, Tex.
Waterworks: $281,095
Vedder Constr. Co., Sweetwater.

Edinburg, Tex.
Irrigation System: $875,000
R. W. Briggs Co., Pharr.
T. Hester, Donna.

Galveston, Tex.
Grain Elevator: $2,000,000
Galveston Wharf Co., c/o F. W. Parker, 2324 Ave. B.

Middle West

Chicago, Ill.
Apartment: $900,000
R. Sollitt & Son.

Chicago, Ill.
Hospital: $1,500,000
H. B. Barnard & Co., 140 So. Dearborn St.

Chicago, Ill.
Bridge Substructure: $454,504
Ketter-Elliott Co.

Attica, Ind.
Hotel: $500,000
Universal Constr. Co., Indianapolis.

Notre Dame, Ind.
Stadium
R. Sollitt & Son.

Detroit, Mich.
Waterworks: $1,083,600 and $538,477
G. R. Cooke Co., 1216 Penobscot Bldg.
E. H. Latham Co., Columbus, O.

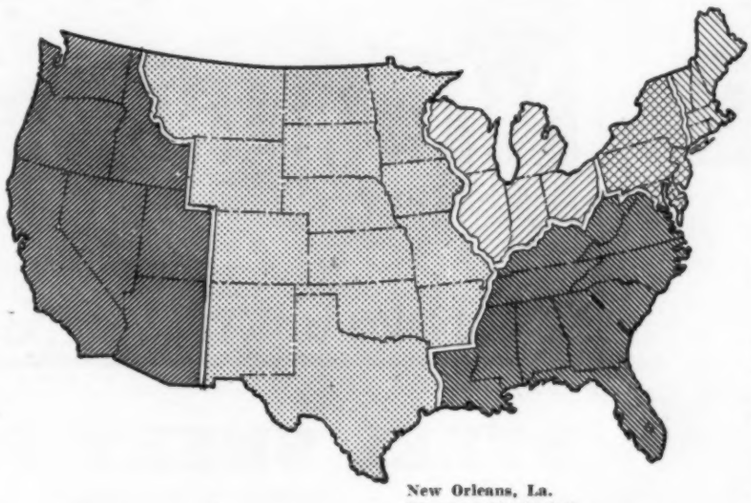
Detroit, Mich.
Office: $1,000,000
Bryant & Detwiler.

Ann Arbor, Mich.
University: $1,500,000
James Baird Co., 101 Park Ave., N. Y.

Oxbow, Mich. (Mail Sodus)
Dam, Power House, etc.
Stevens & Wood, Jackson.

St. Louis, Mo.
School of Medicine: $400,000
Woermann Constr. Co.

St. Louis, Mo.
Sewer: $1,957,175
R. J. Blackburn Constr. Co.



Akron, O.
Bank: $2,000,000
Carmichael Constr. Co.

Cleveland, O.
Jail: $778,286
Hunkin-Conkey Constr. Co.

Cleveland, O.
Sewer: $292,828
Gallagher-Burke Co.

Cleveland, O.
Office: $1,500,000
Austin Co.

Cincinnati, O.
Hospital: $1,500,000
Max Penker Constr. Co.

Cincinnati, O.
Fill, Grading, Etc.: $2,774,870
Winston Bros. Co., Minneapolis, Minn.

Cincinnati, O.
Office and Hotel: $14,000,000
Starrett Bldg. Co., Chicago, Ill.

Cincinnati, O.
Garage: $500,000
Hillsmith & Co.

Dayton, O.
Factory: $500,000
Hillsmith & Co.

Toledo, O.
Bridge: $2,605,653
H. P. Converse Co., Boston, Mass.

Kohler, Wis.
Factory: $1,000,000
P. Riesens Sons, Milwaukee.

Madison, Wis.
School: $539,000
J. H. Kelly.

South

Arkansas.
Railroad Extension: $420,000
Williamson & Williams, Little Rock.

Tampa, Fla.
Acid Plant: $500,000
Chemical Constr. Co., Charlotte, N. C.

Monroe, La.
Paper Mill: $4,000,000
Morton C. Tuttle Co., Boston.

New Orleans, La.
Sewers: $1,270,592
Fuller Constr. Co., Dallas, Tex.

Memphis, Tenn.
Dikes: $542,338
Woods Bros. Constr. Co., Lincoln, Neb.

Memphis, Tenn.
Hotel: $700,000
W. F. Ault, Little Rock, Ark.

New England

Boston, Mass.
Sheds: $1,000,000
New York, New Haven & Hartford R. R. Co., New Haven, Conn.

Boston, Mass.
Bridge: $757,354
Coleman Bros., 245 State St.

Newbury, Mass.
Bridge: $311,776
H. L. Hauser Bldg. Co., Boston.

East Hartford, Conn.
Factory: $1,500,000
Turner Constr. Co., Boston.

Middle Atlantic States

Washington, D. C.
Apartment: $6,000,000
Wardman Constr. Co.

Newark, Del.
Auditorium: $850,000
Lauritson Constr. Co., Du Pont Bldg., Wilmington.

New Jersey.
Dredging: $289,482
Great Lakes Dredge Co., New York.

East Orange, N. J.
School: $536,800
D. O. Evans, Hillside.

Little Ferry, N. J.
Bridge Substructure: $234,005
A. McMullen Co., 50 Church St., New York.

Long Branch, N. J.
Hotel: $3,000,000
C. T. Wills, Inc., New York.

Newark, N. J.
Office: $1,000,000
Starrett Bros., Inc., New York.

Buffalo, N. Y.
City Hall: $6,489,498
J. W. Cowper Constr. Co.

Ithaca, N. Y.
Hotel: $700,000
J. Doll.

New York, N. Y.
Grade Crossing Elimination: $2,473,162
Foley Bros., Inc., 117 Liberty St., N. Y.

New York, N. Y.
Loft: $7,000,000
G. M. Weinstein.

New York, N. Y.
Apartment: $3,000,000
McRae Constr. Co., 485 Madison Ave.

New York, N. Y.
Apartment: $2,000,000
T. O'Reilly, 420 Lexington Ave.

New York, N. Y.
Office: $40,000,000
Starrett Bros., Inc., 101 Park Ave.

New York, N. Y.
Hotel: $1,000,000
A. S. Baker, New York.

New York, N. Y.
Office: $25,000,000
T. Wills, Inc., New York.

Rochester, N. Y.
Bridge: $830,700
Scott Bros., 31 Exchange Pl.

Utica, N. Y.
Prison: $2,969,000
John Johnston Constr. Co.

Philadelphia, Pa.
Office: $2,500,000
Wark Co.

Philadelphia, Pa.
Factory: $1,500,000
E. Fishman & Son.

Pennsylvania
Bridge: $200,000
American Bridge Co., Ambridge.

SEARCHLIGHT SECTION

POSITION VACANT

SUPERINTENDENTS of construction, engaged entirely in heavy construction work, experienced in hydro-electric construction, concrete and earth dams, power houses, rock excavations, etc. If you are open for a position of this description, advertise in the Searchlight Section of Construction Methods. Send your ad to the Searchlight Dept. Tenth Ave. at 36th St., New York.

POSITION WANTED

YOUNG man, years experience in engineers office and in the field (road construction) wants place with contractor to keep books and cost accounts. Experienced in superintending and estimating. PW-93, Construction Methods, Tenth Ave. at 36th Street, New York.

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Guaranteed Condition

Rex 28-S Mixer, gasoline power, complete equipm't.
2—**Tubular Towers**, 188-ft. and 234-ft. each.
3—**Clyde 80-HP. Gasoline Hoists**, 1000 to 7500 lb. at 350-ft. per minute.
2—**Clyde 50-HP. D.C. Electric Hoists.**

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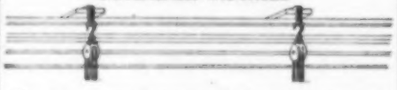
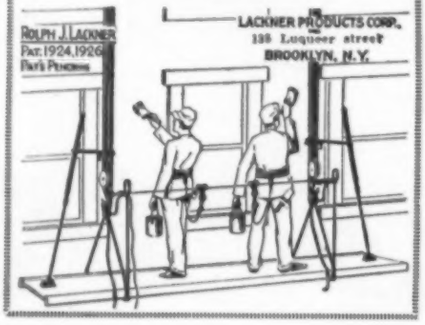
~ UNIVERSALLY INDORSED ~



In 33 states laws call for the use of our Scaffold Safety System. It prevents fatal accidents to building workers, reduces insurance rates and production costs. It is a monopoly, tested and endorsed by the trade. **Offers an unusual opportunity for the investor in distributing company now forming.** Will stand any investigation. Full information on request. Address



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ROCK MEN

Well-known manufacturer of rock-excavating equipment wants two contact men for his sales and service organization. Must be practical and experienced rock men, with record that will command respect and confidence of high-grade contractors and their rock men. One should be especially familiar with contractors and methods prevailing in New York and other Atlantic coast cities. If you know someone who can fill this bill write information about his record and ability. Correspondence confidential.

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Saves you money and trouble in Foundation, Cofferdam, and Sewer work.

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ODEE Pipe for gas lines—factory-welded into double lengths, to cut field welding. Plain end and threaded pipe, with or without couplings. Casing in all sizes. *All ready for immediate Shipment from strategic centers.*

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PIPE ·FOR ALL PURPOSES·

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PERFECT ALIGNMENT

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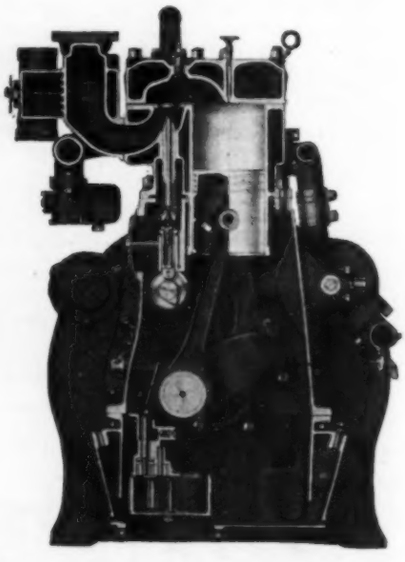
THE truncated cylinder mounting in Waukesha Super-duty Industrial Engines is made possible by the deep, rigid "girder" type crankcase. The outer crankcase wall comes half-way up the cylinder barrel. The cylinder's supporting flange is at the base of the water space... nearly opposite the point of greatest side thrust. Cylinder rocking, leaky oil joints and imperfect alignments are eliminated. ¶ Many other exclusive features are explained in Bulletin 581. Write *Industrial Equipment Division, Waukesha Motor Company, Waukesha, Wisconsin. Offices: New York, 8 West 40th Street; San Francisco, 7 Front Street.*

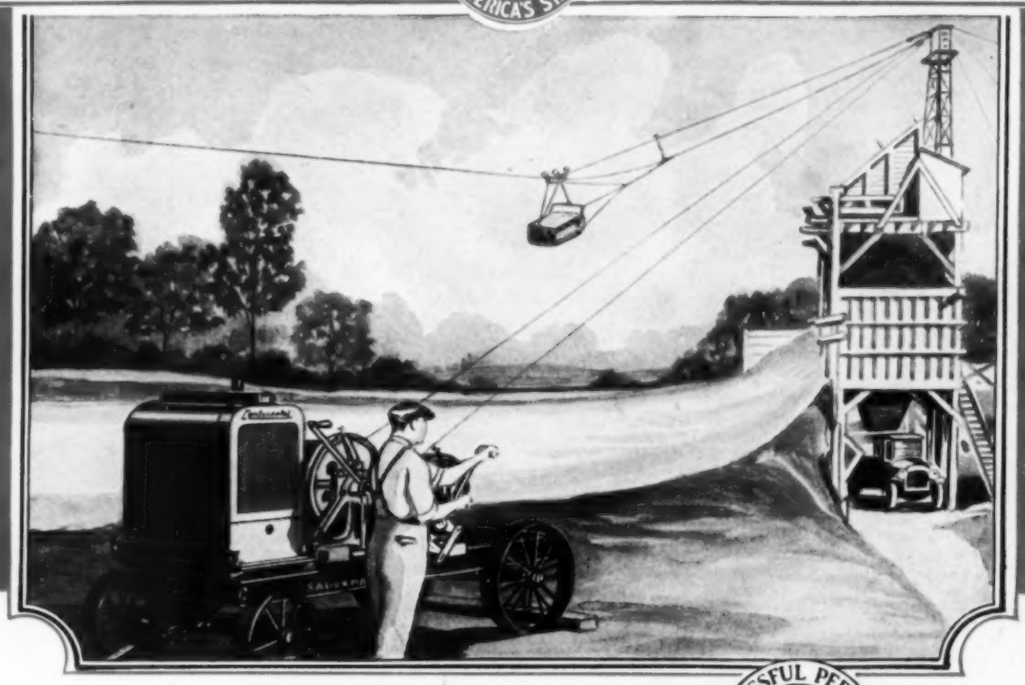
WAUKESHA ENGINES



Cross Section of 4-Cylinder Super-Duty Waukesha Engine.

973

Dependable Power for Every Purpose



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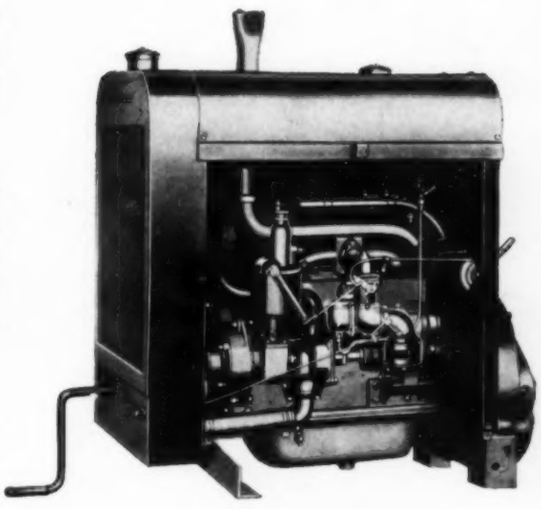
In this field where power, ruggedness, long life, and economy of operation are a determining factor in the difference between profit and loss, Continental Heavy Duty Engines furnish the answer to the question of greater profits.



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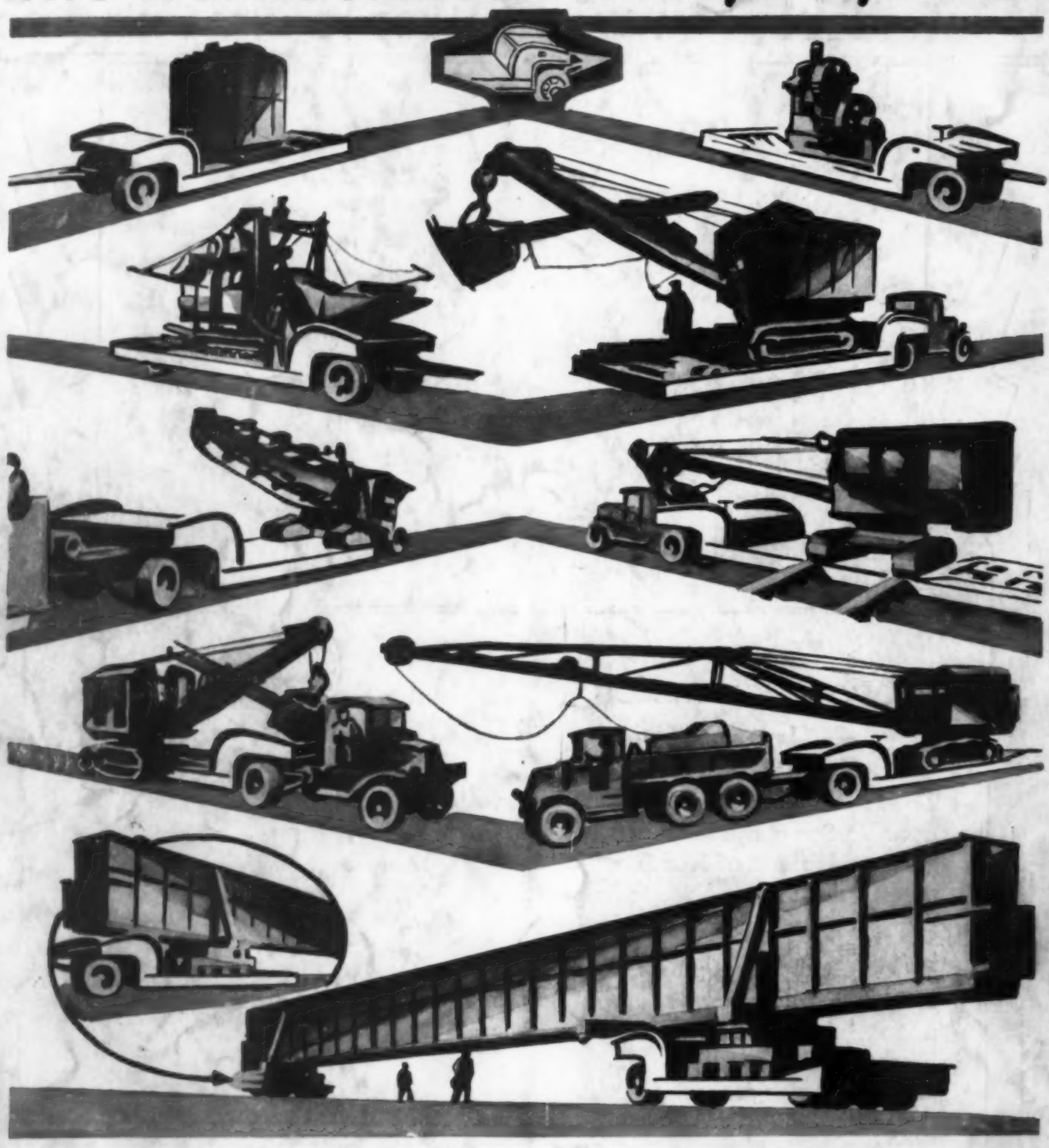
The Largest Exclusive Motor Manufacturer in the World

Continental Engines

The World's Standard Heavy Duty Trailer



IT has been the privilege of this company to prove the statement of a great philosopher who wrote: "The devotion of thought to an honest achievement makes that achievement possible."

For many years, all thought and endeavor of this organization has been devoted exclusively to the development and refinement of heavy duty trailers, or carryalls.

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